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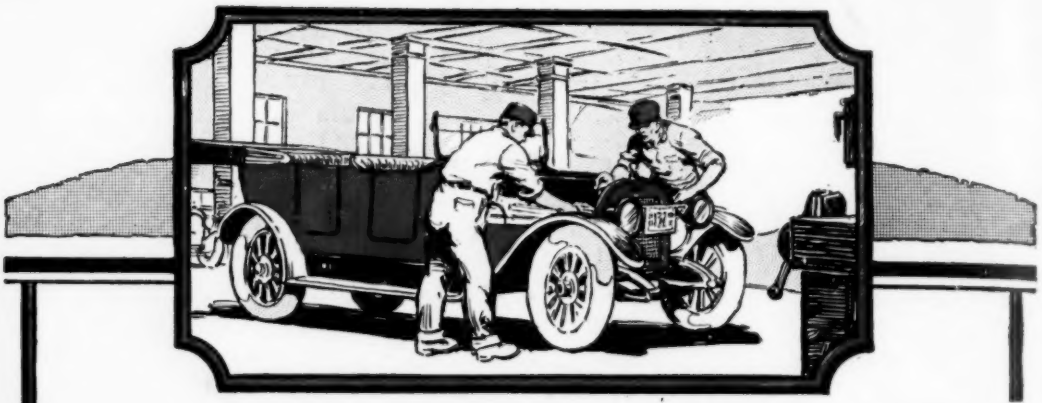

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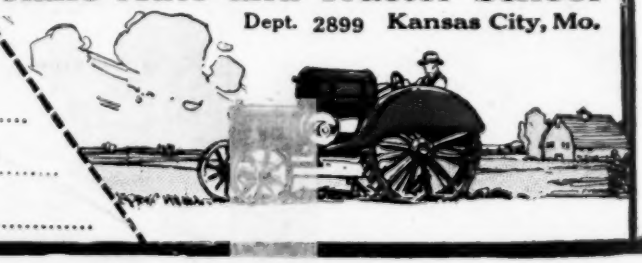

Popular Mechanics Magazine

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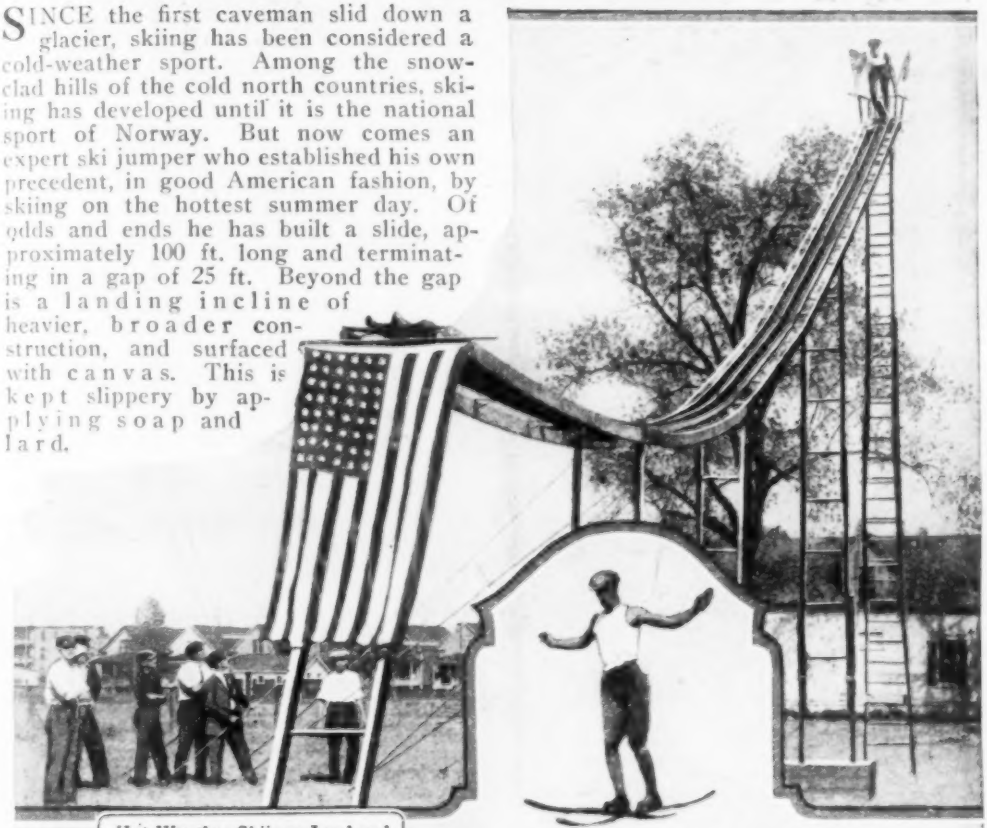
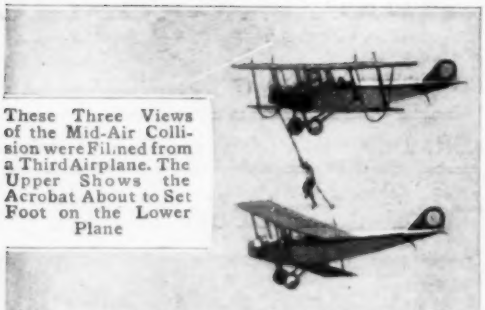
Vol. 32 NOVEMBER, 1919 No. 5

Ski Jumping in Summer Expert's Sport

SINCE the first caveman slid down a glacier, skiing has been considered a cold-weather sport. Among the snow-clad hills of the cold north countries, skiing has developed until it is the national sport of Norway. But now comes an expert ski jumper who established his own precedent, in good American fashion, by skiing on the hottest summer day. Of odds and ends he has built a slide, approximately 100 ft. long and terminating in a gap of 25 ft. Beyond the gap is a landing incline of heavier, broader construction, and surfaced with canvas. This is kept slippery by applying soap and lard.



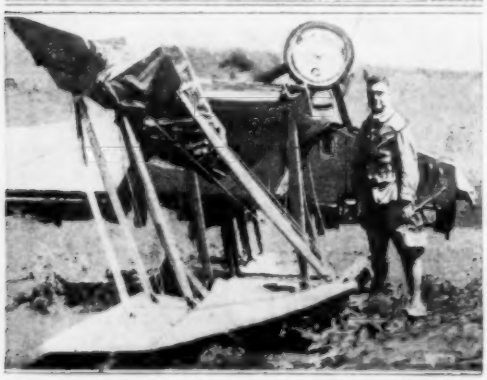
Hot-Weather Skiing: Lard and Soap Make the Slide, Depicted Above, as Slippery as an Ice-Covered Hill. Zest is Added to the Sport by a Leap across a 25-Foot Gap Shown Below



These Three Views of the Mid-Air Collision were Filmed from a Third Airplane. The Upper Shows the Acrobat About to Set Foot on the Lower Plane

A Second Later a Gust of Wind has Flipped Up the Right Wing of the Lower Plane. It Is About to Lock with the Upper Undercarriage

The Acrobat Clutches the Rope as the Two Planes Drop to Earth. Miraculously Neither Pilots nor Acrobat were Killed



PHOTOS BY GILLIAMS SERVICE

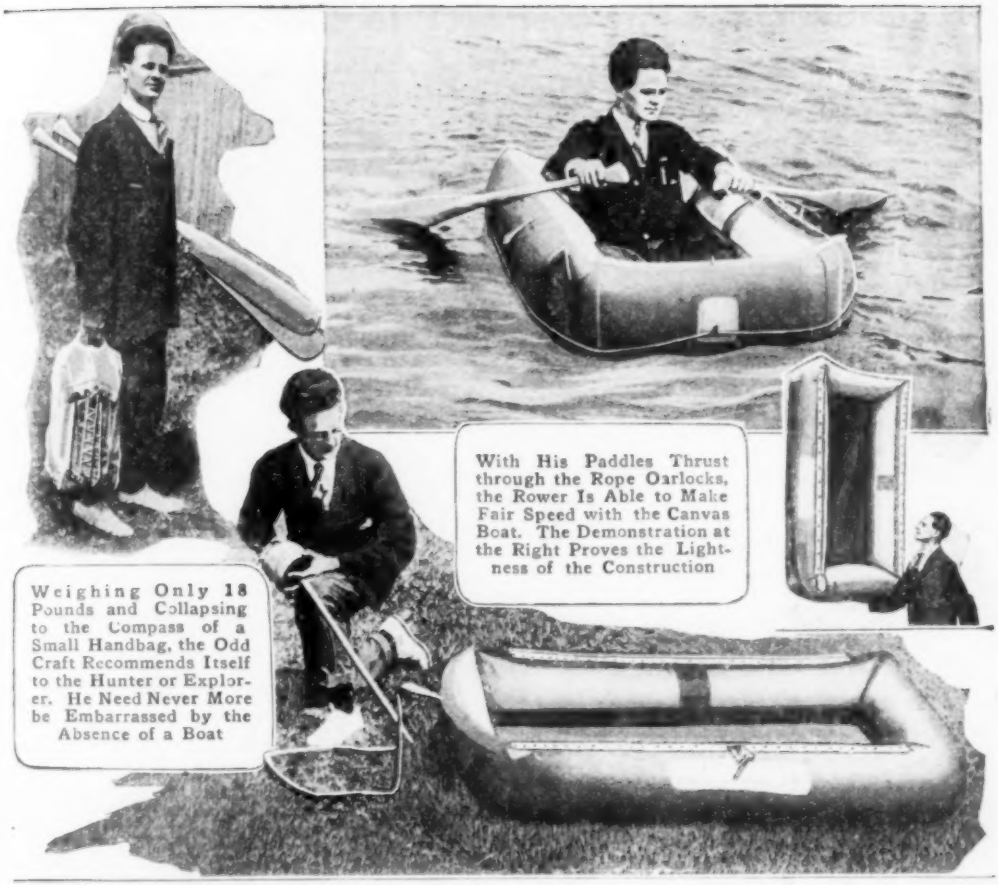
Beside One of the Wrecked Planes Stands the Acrobat, Smiling and Unhurt after an Adventure without Precedent in the History of Aviation

AIRPLANES CRASH IN MID-AIR AS CAMERA MAN TURNS CRANK

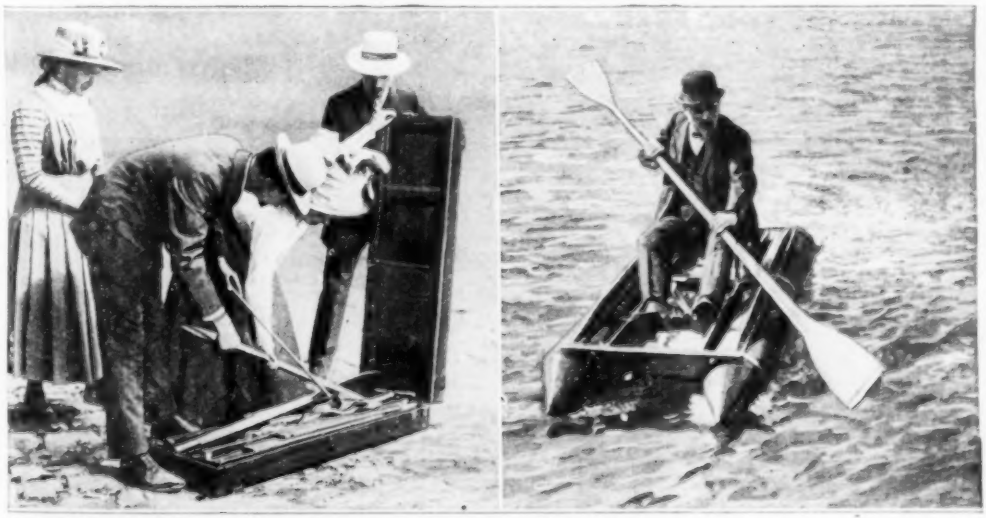
Airplanes have collided in mid-air. Sometimes the airmen have reached the ground in safety; but never until recently had such a miracle been recorded by the camera. The two planes, with a third to carry the camera man, had been chartered for work in a motion-picture drama. At a height of 2,200 ft. a fearless airman-acrobat in the upper plane lowered himself on a rope which trailed from the undercarriage. The second plane approached; the dangling acrobat gathered himself to leap upon it. At that moment a gust of wind flipped up the right wing of the lower plane, locking it with the landing gear of the other. In this fashion the two shot down together, the forlorn acrobat clutching his rope, the imperturbable camera man in the third plane filming every move. At 1,200 ft. the planes jerked apart, the pilots "leveled off" and guided their twisted machines to earth. Both crashed again on landing, yet no one was killed.

DEFLATED ROWBOATS CARRIED IN ONE HAND

Many a vacationist during a summer in the north woods has watched his brawny guide balance the canoe upon his shoulders and carry it thus over a trail of several miles. For the sportsman intent on only a few days' pleasure, however, such a feat is distasteful when not impossible. For his benefit have now been built two small boats that he can carry 12 hours a day without exhaustion. One is the invention of an Englishman. It weighs but 18 lb. and collapses to the size of a small handbag, yet its canvas bottom easily holds a heavy occupant. Each of the four sides is formed of an air-tight bag which is inflated by a hand pump. To the gunwales are fitted locks for the two paddles or oars. The second featherweight boat is more complex in construction but easier to paddle. When collapsed it fits into a wooden box, about the size of the case that is used to hold the popular croquet mallets. Two air-filled bags give buoyancy to the craft, and support the wooden framework with its comfortable seat and emergency air pump. This second craft is really of the "catamaran" type, popular with the natives of many tropic lands. The air-filled bags replace the clumsy logs.


Weighing Only 18 Pounds and Collapsing to the Compass of a Small Handbag, the Odd Craft Recommends Itself to the Hunter or Explorer. He Need Never More be Embarrassed by the Absence of a Boat
With His Paddles Thrust through the Rope Oarlocks, the Rower Is Able to Make Fair Speed with the Canvas Boat. The Demonstration at the Right Proves the Lightness of the Construction

The Sportsman Equipped with This Canvas Rowboat Needs No Boathouse to Shelter His Craft. As He Inflates It with the Little Hand Pump, as Shown Above, It Grows from a Limp Mass of Canvas to a Rigid, Water-Tight Craft. When the Day's Shooting or Other Sport is Ended, He Opens the Four Air Cocks, Folds Up His Boat, and Carries It Home



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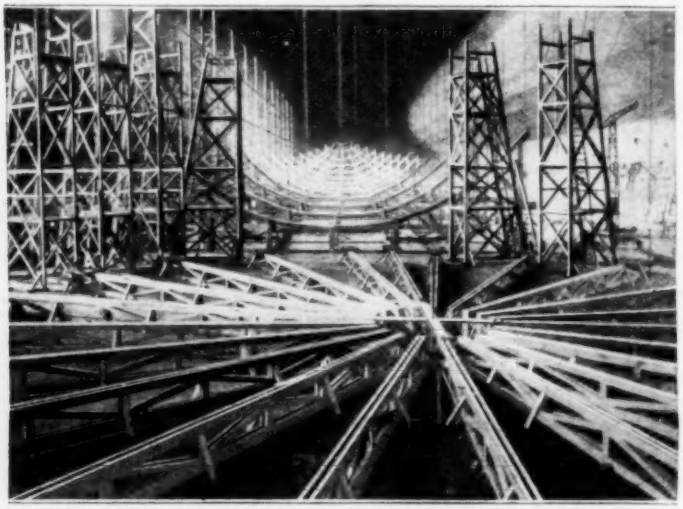
Paddle, Seat, Air Pump, Frame, and Bags, All Fit into the Traveling Case at the Left. This Second Type of Collapsible Boat is Propelled with a Two-Bladed Paddle. Between the Knees of the Paddler, at the Right, is Fitted a Pump with Which the Bags or Pontoons may be Inflated While on the Water

BRITISH BECOME EXPERT IN THE ERECTION OF HUGE RIGID AIRSHIPS

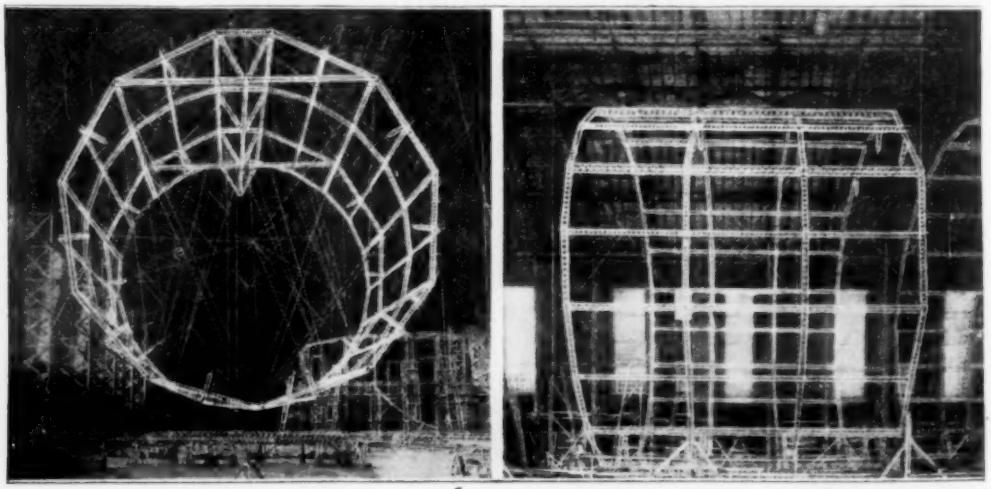
By PAUL A. JENKINS

FEW Americans who witnessed the dramatic arrival and departure of the transatlantic airship "R-34" realized that it was the product of a new and spectacular British industry, ranked as the foremost of its kind in the world. Under the pressure of war have been built specialized machines, have been trained thousands of operatives for every one of the processes used in making the great frames, the gondolas, gas bags, outer fabrics, and engines. In out-of-the-way corners of the island empire have been built monster sheds, some a sixth of a mile long, where workers have grown skillful in assembling the 1,600,000 pieces required for the construction of each giant air liner.

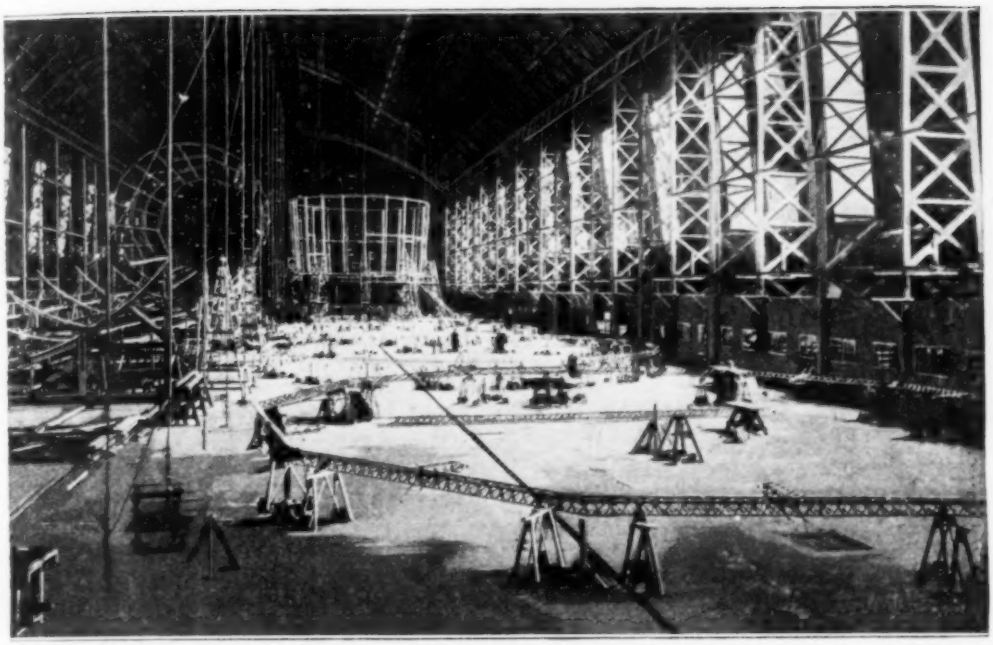


This Photograph Reveals Two of the Secrets of British Airship Construction. In the Foreground is Seen the Radial Jig on Which the Girder Rings are Assembled. Stretching Away into the Background Are the Cradles Which Permit Easy Manipulation of the Giant Skeletons

This assembling of the myriad little parts into the vast rigid framework of an airship like the "R-34" is now accomplished in each of these sheds with a facility gained from many previous failures and discarded processes. First of all are assembled, upon a radial jig, the ringlike girder frames which give the completed airship its transverse rigidity. Due, of course, to the streamline profile of the great hull, the rings vary in diameter, from a few yards for the small frames at bow and stern, to a maximum of 80 ft. for those in the central sections of the ship. The assembling jig is consequently fitted with saddles which slide upon radial arms and may thus be adjusted for the construction of a frame of any size. When four such frames have



A Unit of the Giant Skeleton is Suspended Upside Down at the Left. At the Top is Clearly Seen the Triangular Internal "Keel" Which Permits the Crew to Walk, as in the "R-34," from One Gondola to Another. At the Right, a Unit already Rests upon the Cradles, Where It can be Turned Like a Revolving Squirrel Cage

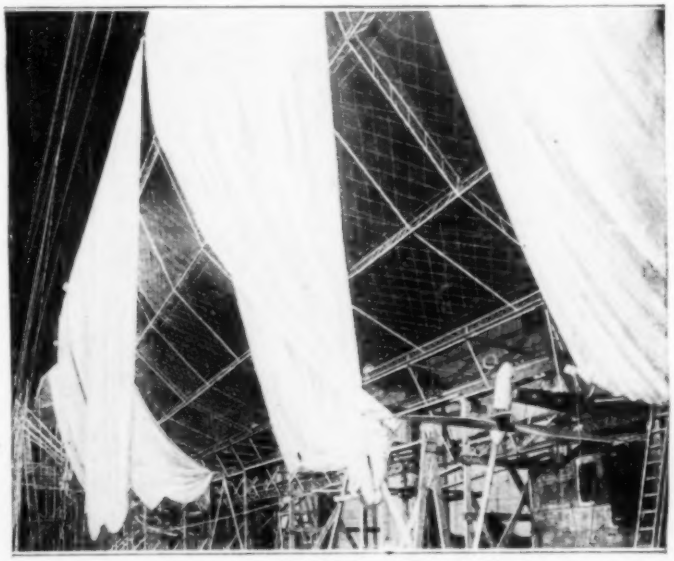


This Striking View of a Great British Airship Shed Illustrates Completely Three Steps in the Process of Airship Construction. The Girder Ring in the Foreground has been Assembled on the Radial Jig. Rising in the Central Background Is an Unfinished Unit of Four Such Rings, Now Joined by Longitudinal Girders. To the Left is seen a Finished Unit Which has been Turned on Its Side and Now Rests on the Cradles

been put together they are rigidly wired and joined, one on top of the other, by longitudinal girders.

As it is completed, each of these structural units of four frames is gently lifted by overhead tackle, turned on its side, and lowered upon circular segmental cradles adjacent to a similar unit. These cradles are in themselves worth noting, being provided with rollers to permit the easy revolution about its horizontal axis of any or all the units. Cumbersome staging is thus unnecessary, the workers simply revolving the huge framework when they desire to work on top or sides, and all heavy work is performed at ground level.

When all these units or sections of the framework, perhaps seven or eight in number, are in place on the cradles they are riveted together to form the completed skeleton of the airship. Bracing wires are strung and tightened from bow to stern; fins, rudders, and elevators are fitted; the 18 or 20 individual gas bags are inserted, and the outer envelope of



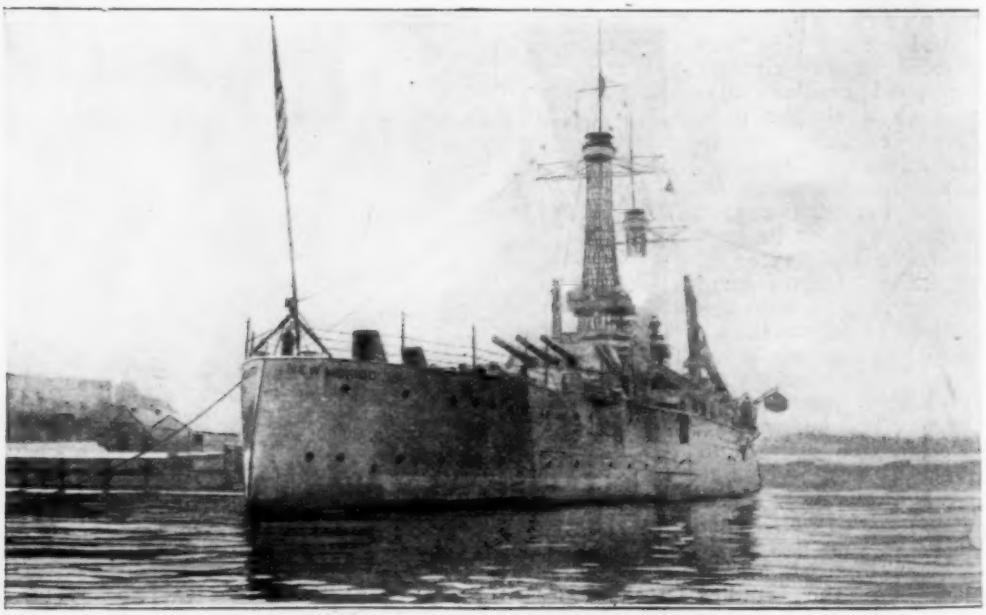
Here the Airship is Nearing Completion. Bracing Wires Are All in Place, the Individual Gas Bags have been Inserted and Inflated. At the Right a Gondola has been Affixed to the Frame. The Fabric Covering is About to be Laced Tightly about the Long Hull

linen stretched over the hull. While this covering is being laced and weatherproofed, the gas bags are gradually inflated with hydrogen, the new airship lifts itself from the cradles by its own buoyancy, and workmen are able to attach to the bottom the control gondola and the two, three, or four "power eggs." Navigating instruments and crew accommodations are put aboard, the engines tested, and the airship is ready for its first flight.

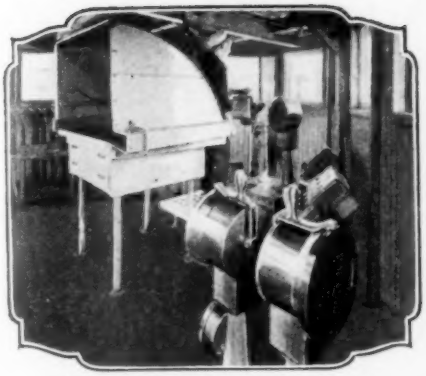
GREAT NAVAL VESSEL DRIVEN BY ELECTRIC MOTORS

America's new superdreadnaught, the "New Mexico," is the first naval creation of its class to depend entirely upon electricity for propulsion, and to be equipped completely for utilizing this form of energy in the performance of practically every task on board. The four ponderous screws which drive the ship are turned by a like number of electric motors, capable of developing 28,000 hp. These receive current from two great turbine-driven dynamos, each producing 14,000 hp. Nine oil-burning boilers produce the steam used in the turbines, as well as in six other smaller turbo-generators, located in different parts of the craft. The latter furnish current to the hundreds of electrical devices installed on the vessel, including the steering mechanism, a ventilating and heating system, and the gun pointers. Even the kitchens are equipped with electrically operated conveniences. A distilling plant produces 30,000 gal. of pure water daily, and a refrigerating system freezes six tons of ice in the same length of time. The "New Mexico" is 624 ft. long, has a beam of over 97 ft. at the water line, and weighs 32,000 tons. About 1,000,000 gal. of oil can be stored in the tanks provided. During a recent trial the boat exceeded a speed of 24 miles an hour.

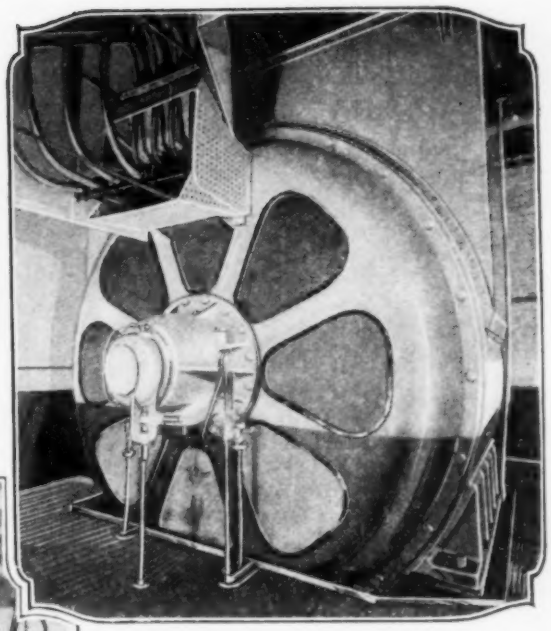
The advantages of electrical propulsion for ships are increased economy, flexibility of control, reliability of operation, and protection of the working elements from damage. The "New Mexico's" tests showed a gain of 20 to 30 per cent in fuel economy over similar ships direct-driven by turbines. Flexibility and reliability are obvious consequences of the electrical way. And with each driving unit in its own protected cell, torpedo or mine could do its worst at that particular point without accomplishing more than to reduce the ship's speed by an amount that would not seriously cripple it.



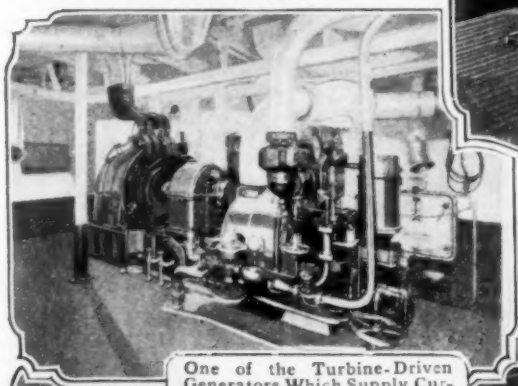
The "New Mexico," a Superdreadnaught Driven and Controlled by Electricity, as It Appeared in the New York Navy Yard a Short Time after Its Completion



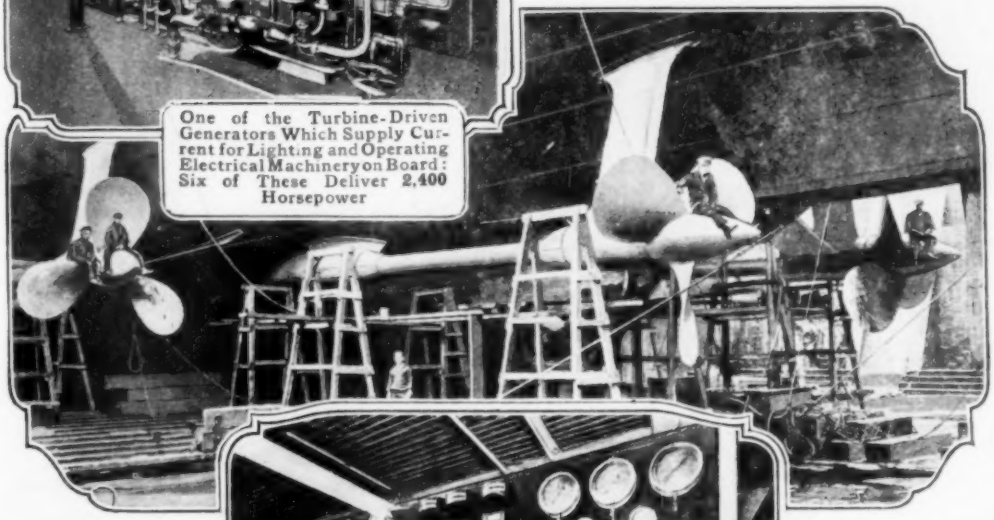
Navigating Bridge of the "New Mexico," Showing the Steering Device and the Apparatus for Transmitting Signals to Different Parts of the Vessel



Four of These Great Motors Propel the Superdreadnaught. Each One Develops 7,000 Horsepower, and Is 12 Feet in Diameter. Their Use Eliminates Gears for Controlling the Ship's Speed



One of the Turbine-Driven Generators Which Supply Current for Lighting and Operating Electrical Machinery on Board: Six of These Deliver 2,400 Horsepower



Some Idea of the Size of the Propellers can be Obtained from the Illustration Above, Which Shows Sailors Sitting on the Giant Screws That Drive the Mammoth Craft Through the Water

On the Left Is a View of the Main Switchboard, through Which Electric Current from the Dynamos Passes on Its Way to the Motors That Turn the Propeller Shafts

CANADIAN DEVELOPS SYSTEM FOR RAISING QUEEN BEES

Queen bees are highly important members of honey-gathering swarms, and the rearing of these egg-laying females is a highly specialized branch of apiculture, in which scientific methods are employed. A Canadian expert in this line has devised a new system for safeguarding the larvæ of queens, and for protecting the young bees during the early stages of their winged lives. When a larva cell is one day old, it is removed from the comb by a cylindrical cutting instrument, from which it is pushed into a short protective tube. The latter is then replaced in the comb, and left until the cell has been completed. A finished cell can be taken from the tube without injuring the larva, and placed in a cylindrical cage of wire mesh, in which the bee hatches and remains until full grown. An opening at the bottom of the cage permits feeding.

Queen-Bee Rearing: On the Left the Man is Cutting Larvæ Cells from a Comb. In Front of Him Are Several Hatching Cages. Above is Pictured a Comb Containing Completed Cells, While Below, at the Right, a Cell is being Inserted in a Protective Tube

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¶A unique radio experiment recently conducted on Long Island Sound forecasts a close coöperation between seaplanes and submarines in the next war. Trailing its antenna 2,000 ft. above the water, the seaplane was able to communicate both by telegraph and telephone with the submerged submarine. Naval officials believe that this union of aerial and subsurface units is destined to be a factor in the coast defense of this country, like the liason between air and land forces.

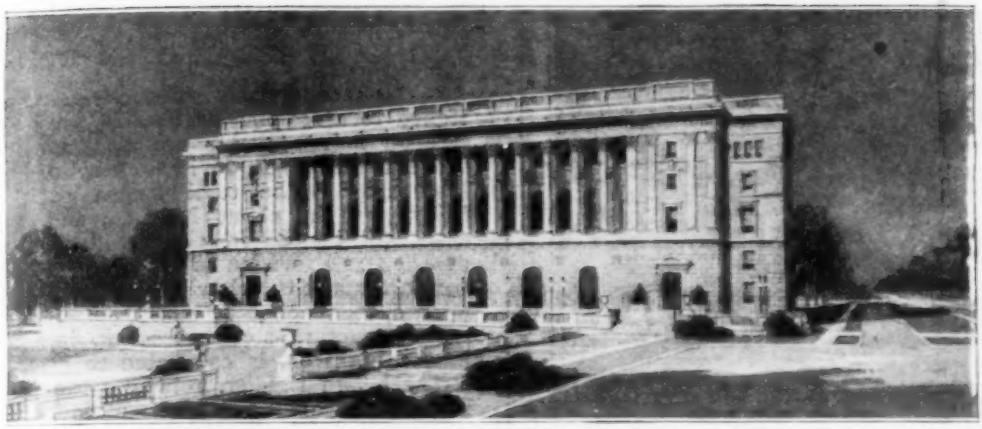
"NEW" BRITISH-CANADIAN CABLE ONCE GERMAN-AMERICAN

Great Britain now has communication with Canada by means of a newly laid submarine cable extending from Penzance, on the extreme southwestern point of England, to Halifax, Nova Scotia. It has just been revealed, however, that the cable is new only in point of location and service. It transpires that the long underwater conductor is the one that formerly connected Emden, Germany, with Coney Island, New York, by way of the Azores. The transfer from German control took place in July, 1917, after which it was used by the British government for all official war business with Canada. Now it is in commercial service, forming a link in the England-to-Australia line.

EASY TO FOCUS HAND CAMERA FITTED WITH NEW FINDER

By making the finder attached to a hand camera big enough to show a full-size image, and fixing the finder lens on the front board of the camera, just above the regular lens, a western inventor has solved the problem of accurate focusing. A 45° mirror reflects the view to a horizontal ground glass, where it is shaded by a folding hood and seen right side up. Mirrors on the hood allow the ground glass to be seen with the camera held in either of the usual positions. The two lenses move, and consequently focus, together. The whole attachment folds inconspicuously against the front of the camera case when the latter is closed, adding little to its bulk.

Combined View Finder and Focusing Apparatus Which Gives a Full-Sized Image: In Use, the Folding Hood is Extended as Shown in the Picture on the Left. Above the Device is Seen Folded



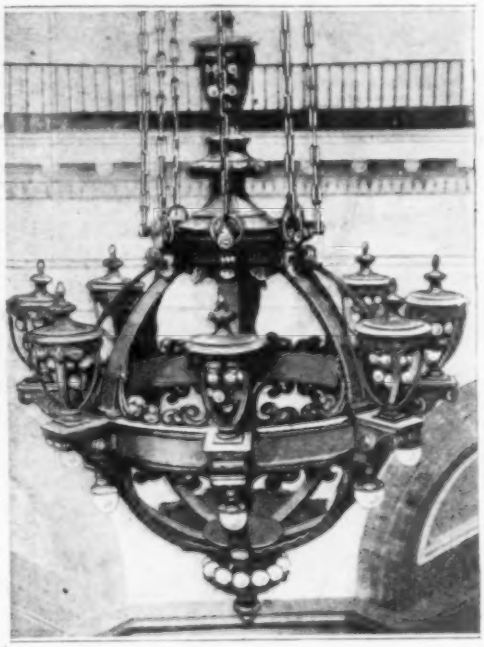
Front Elevation of the Illinois Centennial Building, Showing the Great Recessed Portico: The High Arched Windows underneath the Columns will Serve to Light the Enormous Hall, Which will be Located on the Ground Floor

IMPOSING MEMORIAL BUILDING PLANNED FOR ILLINOIS

An imposing and beautiful structure is to be erected at Springfield, the capital of Illinois, to commemorate the admission of the state into the Union 100 years ago. The building will be 300 ft. long, 100 ft. high, and 100 ft. wide, with a base of granite and a superstructure of limestone. Over the ground floor in front, a great recessed portico, extending nearly the length of the memorial and containing 12 massive marble columns, will serve as an impressive decoration. The interior will be divided into a high-ceilinged hall, 150 ft. in length, a mammoth library and reading room, and historical museums, one of which will be devoted to relics of Abraham Lincoln. Both the interior and exterior will be embellished with sculptural representations of incidents in the history of the state. The official Centennial celebration was held in Springfield, Oct. 1-6, 1918.

MASSIVE BRONZE CHANDELIER ADORNS MISSOURI CAPITOL

Suspended in the rotunda of the new Missouri State Capitol at Jefferson City is a ponderous bronze chandelier, declared to be the heaviest lighting fixture in the country, as well as one of the most elaborate and costly. It weighs 6,500 lb., and is about 40 ft. high and 14 ft. in diameter. The value is $5,000. There are 150 incandescent lights on the fixture, arranged so that no shadow is cast in any direction. These bulbs consume about 5,000 kw. of current an hour. Chains hold the chandelier 160 ft. above the floor, and a windlass is provided for raising or lowering the massive crea-



Bronze Chandelier in the New Missouri Statehouse: The Fixture Weighs 6,500 Pounds and Bears 150 Incandescent Electric Lights

tion. The building which it adorns was erected at a cost of over $3,500,000, and is one of the finest edifices of its kind.

¶An unofficial world's altitude record was recently established by Roland Rohlfs in a Curtiss airplane. He rose 34,500 ft., or more than six miles.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

New Highway Bridge of Reinforced Concrete, to be Built across the Willamette River in Oregon: The Length of Its Center Span, 385 Feet in the Clear, Places It among the Remarkable Bridges of the World. Its Total Length Is About 1,000 Feet, and Its Rise 120 Feet. Stairs at Each End of the Arch Lead to Public Comfort Stations

CONCRETE BRIDGE IN OREGON TO HAVE REMARKABLE SPAN

A concrete highway bridge recently designed to cross the Willamette River in Oregon is remarkable not only for its graceful lines but for its exceptionally long span. The total length of the bridge will be about 1,000 ft., and the span will be 385 ft. clear, with a rise of 120 ft. Provision is made for public comfort stations below the ends of the main span, reached by stairways. Fabricated structural-steel rib work, incased in the big arch, is calculated to give it strength and rigidity, retaining the permanent and artistic qualities of concrete.

BLAZING OIL TANKS FEATURE NEW YORK'S GREATEST FIRE

At 10:15 in the evening telephones jangled in a hundred fire stations throughout New York City, as headquarters transmitted for the first time in its history the signal which orders every fireman off duty to report at once. The great city's greatest fire had started at 2:00 p. m. that day, September 13, when flames leaped from a huge oil tank in a 20-acre refining plant in Brooklyn. One after another 36 of the monster cylinders had blown off their tops. From each now surged a mass of flame, sometimes a thousand feet high. Over the tanks, and spreading fast over surrounding tenements and factories, lowered a mushroom pall of greasy, slow-rolling smoke. From the creek which borders the refinery 12 fireboats pumped streams of water. Right in among the flame-boiling tanks labored firemen from half a hundred engine companies, their faces scorched, their feet blistered by the burning oil. Sight-seers by the tens of thousands united with half-crazed tenement dwellers to press against the fire lines. Thus burned New York's greatest fire all that night and the following morning, when it was finally brought under control. Not for several days, however, did the subsiding flames permit the inspection which revealed a property loss of $2,000,000 or more. A quarter of the loss, or $500,000, was in oil alone. The casualty report of 200 slightly injured seems miraculously light, however, to an observer who remembers the apparently reckless heroism of the police and the frequent panics that swayed the great crowds as they were repulsed by the hot breath of the flames.

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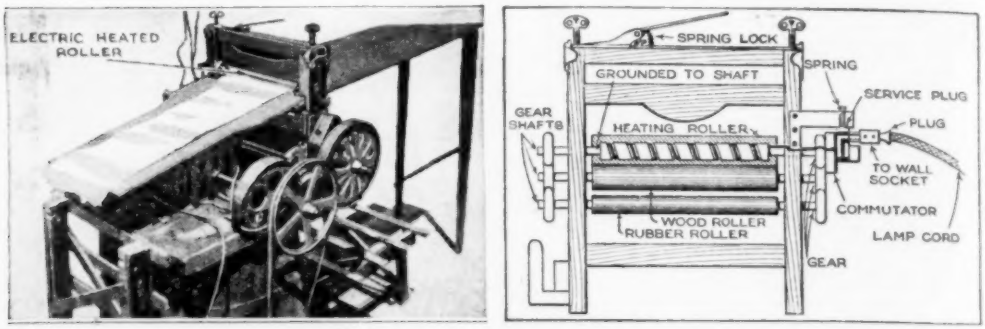
This Telephone Lineman, Busy with Pliers and Cable, Though Only a Few Feet from a Smoking Tank, Was One of a Thousand Men Who Quietly Did Their Duty While New York City's Greatest Fire Burned with Volcanic Fury. On the Tank in the Foreground the Fire Fighters Trained a Dozen Streams in an Effort to Save It. The Tank in the Background has been Crumpled by the Flames

New York City Experienced Its Greatest Fire When 36 of These Great Oil Tanks Exploded and Belched Flame and Smoke for Several Days. Property Loss would have Been Appalling had It Not Been for the Heroism of the Fire Fighters. Pulling Their Lines Even Closer to the Red-Hot Tanks Than Shown Here, They Suffered Scorched Faces and Blistered Feet. As a Spectacle the Fire has, Perhaps, Never been Surpassed



Combination Clothes Wringer and Mangle: On the Left the Device is Attached to an Electric Washing Machine. Details of Construction are Shown on the Right

GOLF PRACTICE IS MADE SAFE BY BOUNCELESS BALL STOP

A golf ball driven, no matter how forcibly, against a loose canvas curtain, goes "dead" and falls harmlessly instead of slicing away, possibly to do damage. In a new device for golf practice and instruction, such a curtain, about 40 in. high and 30 in. wide, is mounted on a

Canvas Backstop for Golf Practice: The Ball Falls "Dead" on Striking the Loose Canvas, the Paper Strip Marking the Accuracy of the Drive

folding frame that leans slightly toward the player, and has canvas side wings further to confine the ball. A strip of paper, fed from a roll at the top, hangs down the center of the curtain, and serves as a target, to be perforated by an accurately driven ball. The contrivance can be used indoors if desired.

¶A wireless station five times the strength of the Eiffel Tower station, with a sending radius of 12,500 miles, or halfway around the world, is to be built at Croix-d'Hins, near Bordeaux, France. Its sending capacity will be 72,000 words a day.

MANGLE FOR HOME LAUNDRY ATTACHES TO WRINGER

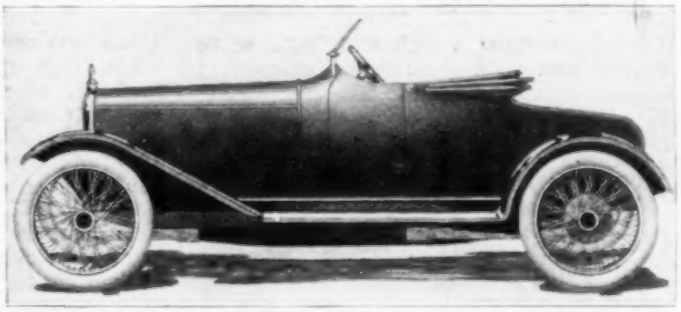
Electric washing machines have become common household utilities, and all the late models are equipped with power-driven wringers. By a simple attachment, a Nebraska inventor now supplies means for converting the wringer into an electrically heated mangle, capable of ironing a family washing in less than an hour. The attachment consists essentially of a steel roller containing a heating coil wound on porcelain, a wood roller, and a service plug. To assemble, the top of the wringer is removed, and the upper rubber roller taken out. The wood bearings are then reversed, and the wood and steel rollers inserted in order. The ironing roller stays hot long after the plug is withdrawn, and is claimed to require very little current.

PATH OVER WHITE MOUNTAINS BUILT BY FOREST SERVICE

Traversing some of the most beautiful country in the White Mountain National Forest, a 40-mile foot trail is being constructed by the Forest Service, and will be ready early next year. The new path will be the first extending from north to south through the government reservation. At frequent intervals along the route will be erected shelters for the use of travelers. A trip over the trail will require about a week. Several names have been suggested as suitable for the road, but as yet none has been selected. Two public camping grounds will be opened in the forest when the trail is completed. Spring water will be piped to these, and stone fireplaces built on them for the convenience of travelers, who will be allowed to use the sites without charge.

MINIATURE AIR-COOLED CAR IS NEW ENGLISH MODEL

That the two-cylinder opposed engine for automobile propulsion will not stay in retirement is evidenced by the power plant of a miniature two-passenger car about to be placed on the market in England. The engine is air-cooled, and the gasoline tank occupies the usual place of the radiator water tank, using the same filler opening. The car is narrow-gauge, tracking only 45 in., though its wheel base is 96 in. The wheels are 28 by 3½ in. The car, fully equipped, weighs but 600 lb., of which the engine accounts for 72 lb. Because of this extremely light weight, a speed of 60 miles an hour can be attained with the 12 hp. available. Except in point of size, the little vehicle's appointments are practically standard. It has four speeds forward, and reverse.



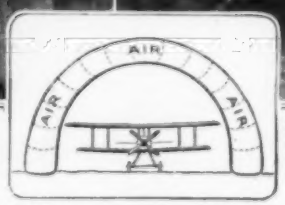
High-Speed, Light-Weight Miniature Car Recently Designed in England, with a 12-Horsepower, Two-Cylinder Opposed Engine: The Wheel Base Is 96 Inches, the Tread 45 Inches, the Weight 600 Pounds, and it is Air-Cooled

AIRPLANE HANGAR INFLATED LIKE A FOOTBALL

The development of a satisfactory portable airplane hangar for field service is one of the necessities revealed to every air service by the late war. The need was glaringly apparent during the last great advances. The flimsy canvas structures then employed fell flat before a strong wind, and during a rainstorm usually held in pools the water not spilled on the planes within. Interest is therefore centering on a portable hangar of French conception and remarkable originality of design. Tent poles and guy wires are conspicuous by their absence. Waterproof, airtight fabric is the only material used. To erect the hangar it is tumbled out of an auto truck, spread flat on the ground, and connected by a hose to a motor-driven air pump. As the air

Though Constructed of Thin Balloon Fabric, the Inflatable Airplane Hangar is Made So Rigid by the Injected Air That the Roof will Support a Man

This Interested Crowd Witnessed the First Public Demonstration of the Inflatable Hangar. The Strange Structure is Manufactured by a French Aircraft Firm



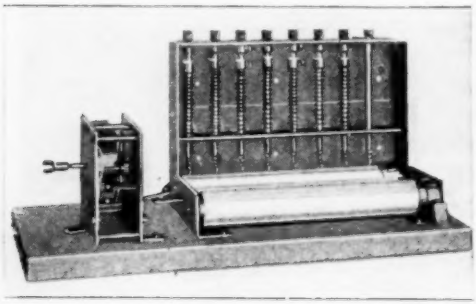
Motor-Driven Air Blowers Quickly Fill Double Walls of the Balloon Fabric. In the Center is Shown Diagrammatically the Double-Walled Construction of the Novel Hangar

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

is forced between the double walls of balloon fabric the hangar grows, becomes rigid, and soon is seen as a dozen tubular arches placed side by side.

AIRPLANE SHOCK RECORDER PROMISES NEW INSTRUMENT

An instrument which will indicate to the airplane pilot the stresses exerted at every moment on every part of his airplane is the logical development of a simple shock recorder now used by the U. S. Navy. The recorder at present consists of a number of vertical styluses held against gravity by coil springs of graded strength. Beneath the stylus points revolves a recording drum at constant speed. When an experimental flight is made, this apparatus is carried in the fuselage, where it records every shock encountered in flying and landing the plane; that is, a number of styluses descend and make their marks at every bump or shock, the intensity of the force overcoming in succession stronger and stronger springs. The proposed instrument, however, will be more complex. Individual recorders will act as electric contact makers in body, wings, and undercarriage. From each recorder wires will lead to the pilot's instrument board, where tiny electric bulbs will give him instant warning of dangerous stress and possible breakage. A tentative instrument of this kind has actually been used in the experiments of the navy experts.



BY COURTESY OF THE JOURNAL OF THE FRANKLIN INSTITUTE

From This Rudimentary Airplane Shock Recorder has been Developed an Experimental Instrument Which Informs the Pilot of the Comparative Stresses throughout His Machine

PHOTOGRAPHER SNAPS DIVERS IN THRILLING FEATS

The dictionary informs one that "to dive" he simply "plunges into water head foremost." It's easy to imagine how old Noah Webster, having thus settled the thing in his mind, then might have journeyed to the seashore—and fallen into the water with a resounding smack. In that way he would have learned to define diving as an art. For it requires practice, and like any art rewards its devotees with its own peculiar thrills.

The fascination of swift passage through the air, the exhilaration of the water's cool embrace, the very spirit of the sport have been caught by the photographs on this and the opposite page. The tumbling leap from the old pier arrests the eye as does the girls' unusual double dive. Equally plucky are the maimed veterans in the hospital pool.

By Carefully Counting Feet, One Finds That Four Swimmers Posed for This Unusual Photograph. Three are Diving Straight for the Water, Many Feet Below. The Fourth is Adding the Dangerous Thrill of a Somersault

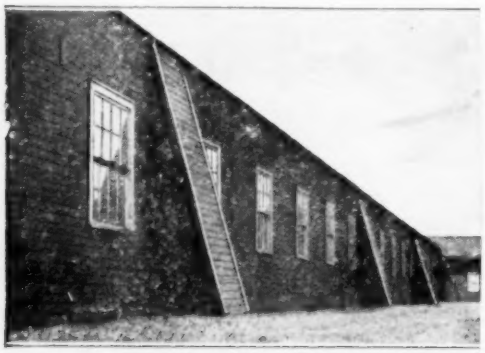
Caught as They Dive Together for a Friendly Tilt Are Six Soldier-Inmates of a Great Reconstruction Hospital in Washington, D. C. The First Two Have Only One Leg Apiece, the Third Makes His Way with One Arm. The Pool was Donated to the Hospital Because of Swimming's Recognized Value in Restoring Health and Muscular Poise

The Girls are Here Showing the Boys a "Coöperative" Dive That Never Fails to Attract Attention. Each with an Arm about the Other, They have Jumped from the Platform to the Water, a Dozen Feet Below. The Stunt Requires More Daring Than Skill, So may Easily be Made the Basis of Friendly Competition by Members of a Swimming Party

The Almost Unbelievable Disintegration of the First Wooden Coach is Seen by a Glance at the Rubbish-Hidden Locomotive on the Left. The Fate of the Second Coach was Different. Striking the Overturned Locomotive Less Squarely Than the First Coach, It Lost One Entire Side. Passengers and Seats were Scattered over the Right of Way. In the Photograph at the Right the Second Coach has been Restored to the Rails

EXTERNAL BRACES EMPLOYED TO STRENGTHEN SHED

In order to dispense with obstructive cross timbers and vertical supports inside a large farm-implement shed, erected recently on a middle-western farm, a novel method of strengthening the building was employed. Inclined braces were placed at intervals along the sides of the structure, extending from the eaves to the ground. Over these were nailed clapboards, form-



Clapboard-Covered External Braces, When Used to Strengthen a Farm-Implement Shed, do Not Mar the Appearance of the Building

ing boxes which effectively concealed the unsightly props. The unusual braces render the building capable of standing through any ordinary windstorm.

¶ One and one-half million brass cartridge cases of various sizes have been placed on sale by the War Department at 20 per cent above the current value of the metal contained in them. Included are a number of artillery cases, suitable for making lamp bases, or other articles.

RAILROAD WRECK SMASHES OLD COACHES TO KINDLING WOOD

A train of heavy steel passenger coaches would have come off with a few scratches and broken panes. Being of wood, however, the cars in a recent railroad wreck collapsed with a completeness almost unprecedented. As the engine left the rails and plowed into the right of way, it was followed by the two nearest coaches. The first of these, backed by the terrific momentum of the entire train, crashed upon the engine and crumpled like an eggshell. Wreckers likened it later to casual rubbish at a city dump. The next coach ripped itself open from end to end upon the recumbent engine, spilling out seats and passengers in wild confusion. Several persons were hurt, some mortally.

ILLNESS CAUSED BY GASES FROM FACTORY CHIMNEY

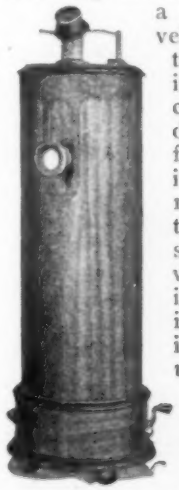
Gases resulting from combustion, particularly carbon monoxide, are responsible for many cases of illness among inside workers, according to medical authorities interested in the prevention of occupational diseases. In one case on record, 73 out of 125 persons employed on the three upper floors of a 12-story factory building were affected simultaneously by chimney gases which entered through a trapdoor on the roof, and reached the workrooms through a hallway at the end of the structure and the corridors on the different floors. The workers complained of dizziness, headache, and general weakness. Most of them recovered within a few hours.

RECOMMEND OIL TREATMENT FOR LEATHER ARTICLES

Applying oil or grease to shoes and other leather articles will greatly prolong their term of usefulness, according to government experts. Castor oil is recommended for dress shoes. This should be used sparingly, and thoroughly rubbed into the leather. If it is applied at night, the shoes can be polished the following morning. Tan shoes become slightly darker after this treatment. When it is not desired to polish shoes, neat's-foot oil, fish oil, and tallow, vaseline, or petrolatum are suitable. These should be warmed before their application, though the temperature should not be high enough to be uncomfortable to the hand. Before shoes are oiled or greased they should be carefully cleaned, in all cases. Harness should be washed frequently in tepid water with a neutral soap, and oiled before it has dried. Excess oil should be removed with a cloth. This keeps the leather pliable.

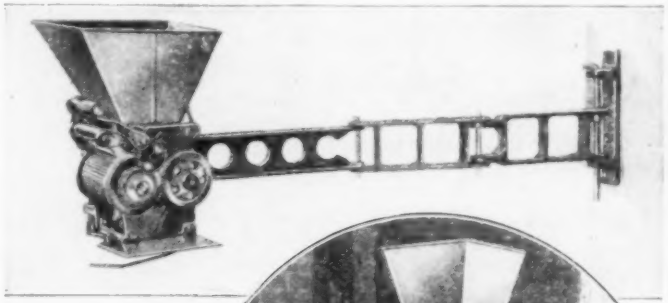
DENTAL X-RAY MACHINE HAS SPECIAL TUBE IN CABINET

Making dental X-ray photographs is becoming almost as simple as operating a camera. A recently developed machine has its tube, transformer and all, inclosed in a cylindrical cabinet, only 20 in. in diameter and less than five feet high. The patient sits in an ordinary chair and rests his head against the adjustable, funnellike shield of the exposure window, the operator making the exposure by pressing a foot lever. The tube is of special construction, using a very small current and remaining cool even after repeated use. It is almost wholly inclosed in a thick lead sheath to prevent any possibility of burns. No special training is necessary to operate the device.



AUTOMATIC DOUGHNUT CUTTER BUILT FOR USE AT FAIRS

The hand-forged doughnut will continue to have its devotees, but for large output at carnivals and fairs a new automatic cutter has undoubted advantages. The machine is set up in a booth or show window with a stove and large pan of cooking grease underneath. The hopper is then filled with dough, the crank is turned, and the dough is forced into a vertical reservoir formed of an outer and inner cylinder. Issuing from this reservoir as a continuous "pipe" of dough, it is sliced by a reciprocating horizontal knife into individual doughnuts. These fall into the hot grease, whence they are lifted when brown, sprinkled with sugar, and sold to the ultimate consumer.



The Doughnut Cutter is Attached to a Post or Wall by This Long, Hinged Arm, Which Holds It over the Cooker

As the Operator Turns the Crank of the Doughnut Cutter a Horizontal Knife Blade Speeds Back and Forth beneath the Dough Reservoir. For Every Trip of the Blade a Raw Doughnut Drops into the Cooking Grease in the Pan Below

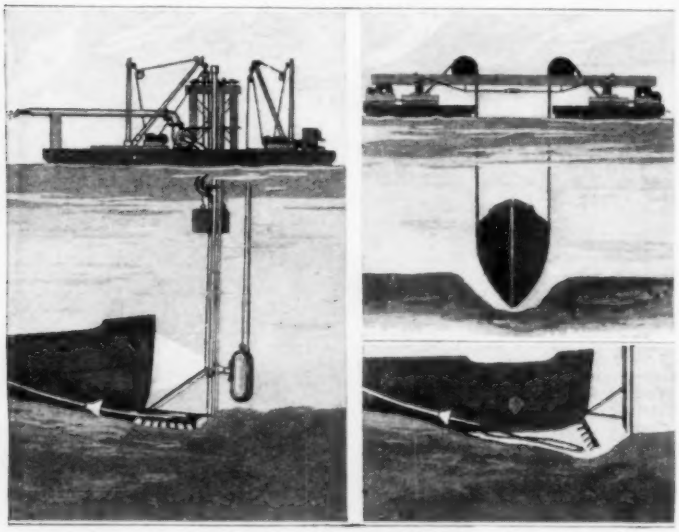
¶Two automatic-telephone exchanges about to be installed in Copenhagen, Denmark, will be fitted with American equipment, purchased from a manufacturer here. The exchanges are to have a 10,000-subscriber capacity and will cost over one million dollars.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

POST-WAR SALVAGE PROBLEM DEVELOPS NEW DEVICES

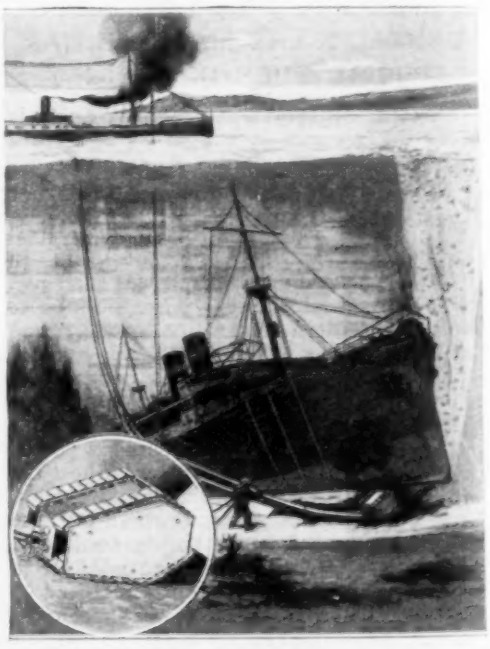
By HAROLD W. NORFOLK

SCATTERED over the bottom of the ocean is a vast fortune in ships and cargoes, sent down by mines, submarines, and other instruments of naval warfare during more than four years of international strife. Now that hostilities have come to an end, serious attention is being given to the problem of raising these submerged wrecks, salvaging their sometimes valuable contents, where the damage by water has not been too great, and putting the vessels back into commission. Contrary to popular belief, many of the sunken craft can be brought to the surface and restored to serviceable condition with the expenditure of only a small amount of time and money. Myriad inventions have been offered to assist in floating the lost fleets. Some are absurd, but among the collection are numerous devices of practical value. Many of the latter, no doubt, will be adopted by the salvaging companies which are planning to retrieve the now worthless tonnage.

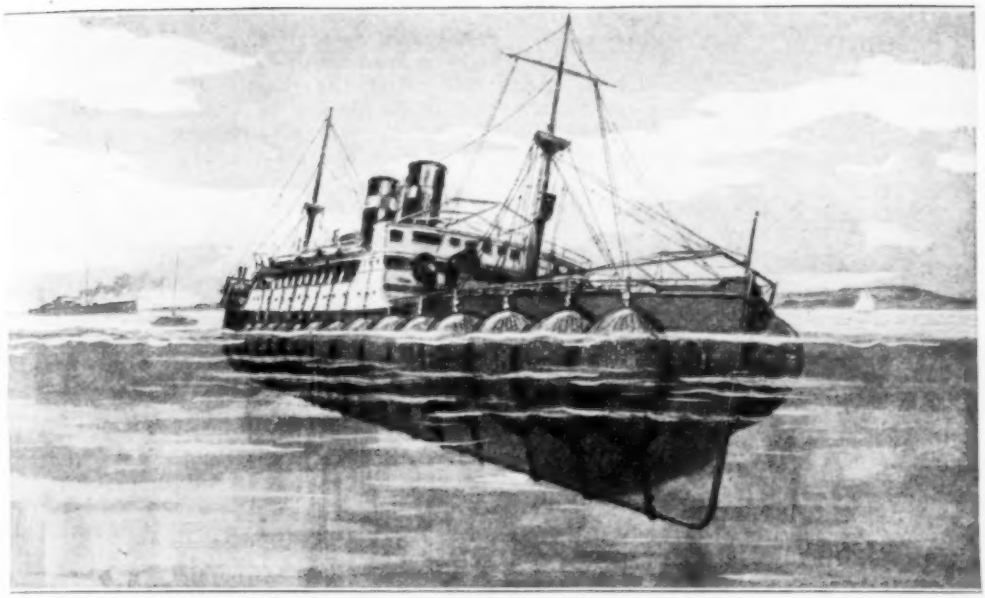


In the Diagram at the Left the Rotary Rake is Shown Undermining the Prow of a Sunken Ship. The Method Employed in Raising the Vessel is Illustrated on the Right

One accepted method of reclaiming sunken ships is by means of pontoons. These are attached to cables or chains passed under the hull, which is pulled from its resting place by the buoyancy of the floats, and eventually brought to the surface. The chief difficulty encountered in this work is in placing the cables. In cases where the vessel has settled a considerable distance into the sand, the operation requires much time and labor. Ingenious machines for digging under the wrecks and carrying cables through the tunnels thus formed have been developed, and are expected to expedite salvaging to a great extent. One device of this type resembles the armored tanks that played such an important part on the battle fields of Europe. Endless treads on either side of the burrower carry it forward in a path sluiced by a powerful stream of water. Power is obtained from a small hydraulic turbine, contained within the contrivance, and supplied with water under high pressure by pumps carried on a lighter which is anchored over the wreck. A diver guides the machine, which is declared to be capable of tunneling under a hull in a surprisingly short time. Another



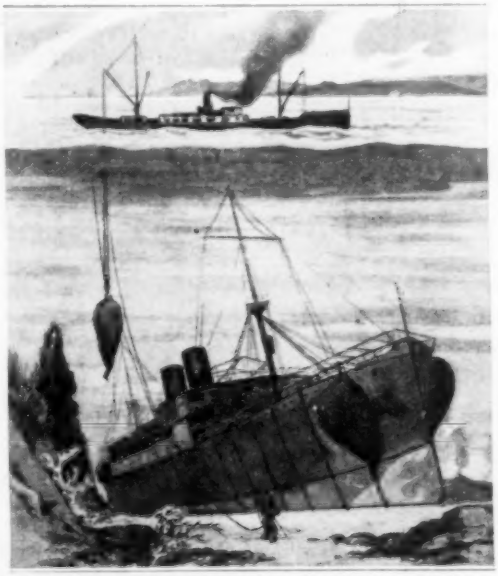
Modeled Like a Fighting Tank, This Burrowing Machine, Guided by a Diver, Crawls underneath a Hull, Dragging a Cable through the Resultant Tunnel



Inflatable Pontoons Supporting a Vessel: These Balloonlike Floats Consist of an Inner Case of Rubber Covered with Canvas and Rope Netting. Attached as Shown in the Picture and Filled with Air, They Quickly Bring a Submerged Wreck to the Surface

somewhat similar device comprises two revolving screws, actuated by a hydraulic turbine. It is designed for use on soft bottoms.

Different in principle is a third apparatus, the most important part of which is a large rotary rake for digging under the prow or stern of a sunken vessel so that pontoon cables can be slipped under the hull from one or both ends. The rake is fastened near the end of a pointed steel pile, which is used to moor a lighter over the scene of operations, and is revolved first in one direction and then the other by a cable, which runs in a groove around the edge of a circular base that holds the sharpened teeth. The ends of the cable are attached to two tugs, which steam alternately toward and from the wreck. A suction pump removes material loosened by the rake. This curious apparatus is directed from a submarine cage, large enough to hold a man, which is suspended in a convenient position. A powerful searchlight on the cage illuminates the rake and its surroundings.

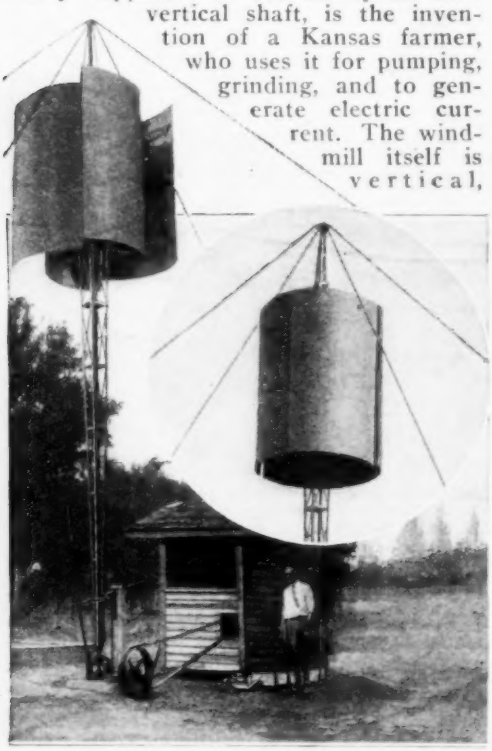


Preparing to Resurrect a Submerged Ship: Deflated Pontoons are Lowered from the Lighter and Fastened to the Lifting Cables by a Diver

Inflatable pontoons are another recent contribution to salvaging equipment. These are shaped somewhat like balloons, and include inner cases of rubber covered with heavy canvas, and further protected by a rope net. When deflated, the bags can be submerged and fastened to the ends of lifting cables. Filled with air, their buoyancy brings the wreck to the surface. Each pontoon is fitted with two valves, one for admitting air, and the other for releasing it.

WINDMILL ON VERTICAL AXLE REQUIRES NO TOWER

A towerless windmill, which is practically supported in the air by its own vertical shaft, is the invention of a Kansas farmer, who uses it for pumping, grinding, and to generate electric current. The windmill itself is vertical,



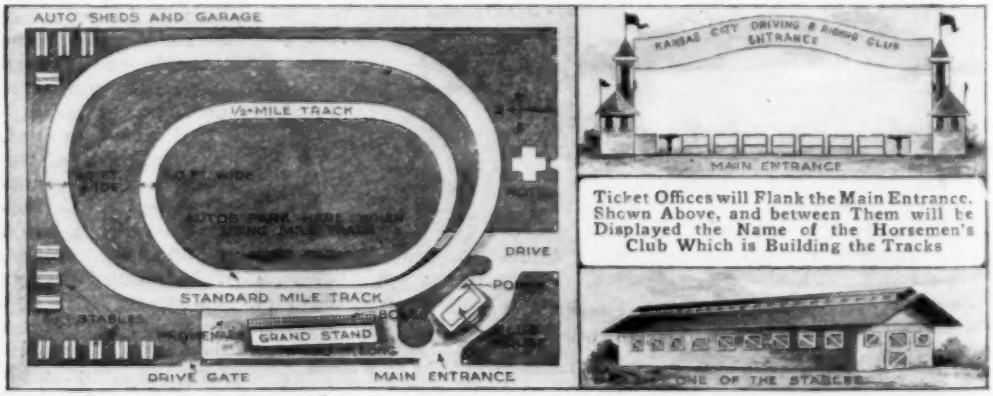
Towerless Windmill: Extended, the Sections are Rotated by Air Currents on a Vertical Shaft. The Insert Shows Them Closed

consisting of four sections of a metal cylinder mounted directly on the shaft, which runs in an open framework held upright by guy wires. When the vanes are closed and form a complete cylinder the mill is stationary, but when turned by a lever so the edges project and catch the wind, the shaft is rotated and transmits its power by pulley and belt. To keep the speed constant, an automatic governor operates on the inner edges of the vanes.

NOVEL RACE-TRACK PROJECT FOR KANSAS CITY

A novel race-track construction plan has been approved by a horsemen's club of Kansas City, Mo., and work on the project will begin in the near future. Two elliptical dirt courses will be built, one within the other, the larger one mile in circumference, and the smaller half that distance around. The former will be 90 ft. wide, and the latter 60 ft. Motor cars will be parked within and on the shorter track when the one-mile course is in use.

Improvement of the ground surrounding the tracks will be accomplished by the erection of a large hotel, intended for the use of visiting turfmen; a modern clubhouse and a grand stand, the latter 400 ft. long and capable of seating thousands of spectators. Eight stables, each providing quarters for 20 horses, will be built, besides four sheds for automobiles. A cinder path from the stables to the tracks will make it possible for trainers to exercise their animals when the tracks are in a muddy condition. It is estimated that more than $160,000 will be required to carry out the plan. Two entrances will be provided, one for pedestrians and the other for vehicles. There is now no race track within convenient distance of the city. Meets have been held in a playground.


AUTO SHEDS AND GARAGE
½-MILE TRACK
STANDARD MILE TRACK
GRAND STAND
STABLES
DRIVE GATE
MAIN ENTRANCE
KANSAS CITY DRIVING & RIDING CLUB
ENTRANCE
MAIN ENTRANCE
Ticket Offices will Flank the Main Entrance, Shown Above, and between Them will be Displayed the Name of the Horsemen's Club Which is Building the Tracks
ONE OF THE STABLES

Kansas City Race Tracks: In the Plot at the Left can be Seen the Arrangement of the Grounds. The Stables, One of Which is Pictured on the Right, will House 20 Horses Each

MARATHON CANOEIST MAKES DARING TRIP

By L. W. PEDROSE

WHAT is said to be the first trip over the route ever made by a white man in a canoe and alone, was accomplished by a former officer in the A. E. F., recently discharged from the service, when he rowed his frail boat from Seattle to Skagway, 1,600 miles, in 80 days, including 28 days spent on side trips and in camp along the route. He carried with him only his camping outfit, a gun, and a typewriter. His adventures included hobnobbing with fishtrap pirates; camping with Alaska Indians, who believed his use of the typewriter was black magic and bad medicine; a close escape from death at Stickine Glacier, and detention once on a charge of murder. He lost five pounds in weight on the voyage, but the only sickness he suffered was a cold, which he believes he contracted while sleeping between sheets in his stateroom on a steamer while homeward bound.

The trip was continually stormy, and the hardy canoeist was wet through to the skin most of the time. His breakfast, as a rule, consisted of two pancakes, two slices of bacon, and thirteen prunes. He laid the prunes along the deck of the boat and munched them as he rowed. For other meals, he varied the diet with fish that he caught, and small portions of meat and vegetables from a precious little stock of canned goods.

While visiting the Indian town of China Hat, near Bella Bella, the wayfarer was entertained by the Indians and treated with the utmost courtesy. Two weeks later he arrived at Lowe Inlet and learned how close a call he had had with death. The night he had stopped at China Hat, an Indian woman and her daughter had been found dead, and he was suspected of killing them with the black magic of his typewriter to obtain $500 which they were believed to possess. The Indians, although apparently friendly, were preparing to make away with him when he departed. Only the fact that he was a white man prevented them from following him and seeking vengeance. At Lowe Inlet he was closely questioned by the magistrate and would have been put in jail had not a cannery tender arrived with the intelligence that the Indian woman and her daughter had been drowned.

At Juneau, the canoeist met Governor Thomas Riggs, who had heard of his trip and came down to the docks to meet him.

At Wrangel, the voyageur purchased a tiny white Malemute pup, which accompanied him the remaining 400 miles of the trip. The dog was with him when he made a landing on the Stickine River, climbed Muir Glacier and lost his way. Caught in a pocket between two 80-ft. walls of ice, he remembered reading of travelers who had cut steps in the face of the ice and climbed out. He whittled with his knife till his hands became numb, but found that hewing ice with a knife was only fiction. He finally managed to wriggle his way to freedom through a hole in the glacier.

The marathon canoeist plans next to visit the interior of Japan. Then will come South America, where he plans to ascend the Amazon River, from its mouth to one of its tributaries in the Andes.

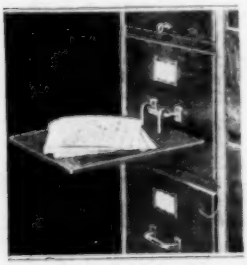
TRANSFER RAILROAD TRACK WITH LOCOMOTIVE CRANE

Considerable time and labor were saved on an Ohio railroad recently by utilizing a locomotive crane for transferring a short stretch of track from one location to another. The track was divided by uncoupling the rails, and each section thus formed was lifted by the machine and transported, with the ties attached to the rails, to the new roadbed, where it was lowered into place and quickly made ready for service. Ordinarily such work is done by removing the rails from the ties and moving the two separately.

Locomotive Crane Transferring a Railroad Track: Sections Such as That Shown in the Picture were Lifted from an Old Roadbed and Placed in a New Location by the Powerful Machine

SHELF FOR FILING CABINET HANGS ON DRAWER HANDLE

A new convenience for the filing clerk has made its appearance on the market. The device is an oak shelf, 12 in. square, equipped with two metal hooks which permit its attachment to the handle of a filing-cabinet drawer. Papers can be laid on the shelf, leaving the hands of the clerk free to insert the documents in their proper places. To prevent damage to the cabinet, the hook ends are rounded.



STEAMSHIP PROPELLER SHAFTS TURN ON WOODEN BEARINGS

While inspecting the head of a golf club or fitting a caster to the dining-room table, few landsmen realize that they are handling wood from the West Indian guaiacum, or lignum-vitæ tree. Fewer realize that this same wood has been used to make propeller-shaft bearings for every battleship and ocean liner on the high seas. This wood, alone of the thousands upon the earth, will survive the grinding rotation of the great shafts. The reason is found on examining a lignum-vitæ log. The sap cells are seen to be full of heavy, solidified resin. Successive layers of fiber are arranged obliquely to each other, making it impossible to split the log. Fibers cross and recross until the log is bound into one close-knit mass.

DEAD FISH BELIEVED KILLED BY MYSTERIOUS MOSS

Western fishermen would like to know what mysterious agency is responsible for the death of the fish in Klamath Lake, which lies in southern Oregon at the foot of the Cascade Mountains. Thousands of beautiful trout have recently floated to the surface, dead, yet showing not a sign of violence or disease. Many sportsmen, thinking of Crater Lake, only 30 miles to the north, declare that a volcanic disturbance is to blame. But a few others support a different theory. They point to the water of the lake, once clear as crystal, now muddied everywhere by particles of brown moss. They believe that some subterranean inlet has vomited great masses of the moss into the lake, enveloping and smothering the fish.

¶ Paris finds that the military motor trucks which rumbled endlessly through her streets during the days of war have left other marks than torn and rutted pavements. Monuments, old houses, and many palaces have been injured by the jarring vibrations of the unusual traffic.

GERMANY ADDS AIR LINER TO COMMERCIAL FLEET

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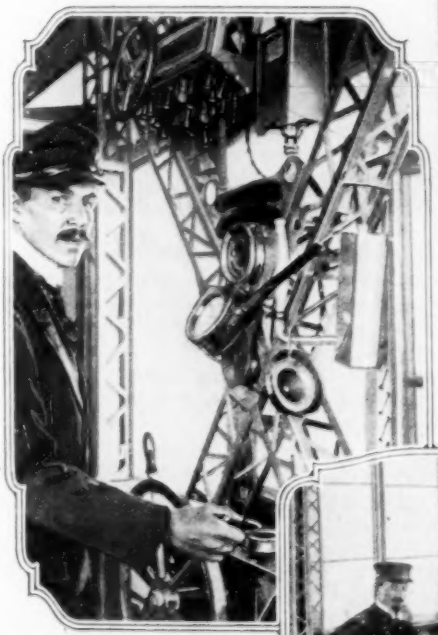
The Hamburg-American Air Liner "Bodensee" Recently Carried 40 Passengers on Its Maiden Flight of 375 Miles from Friedrichshafen to Berlin. Hot Meals were Served during the Uneventful Six-Hour Journey



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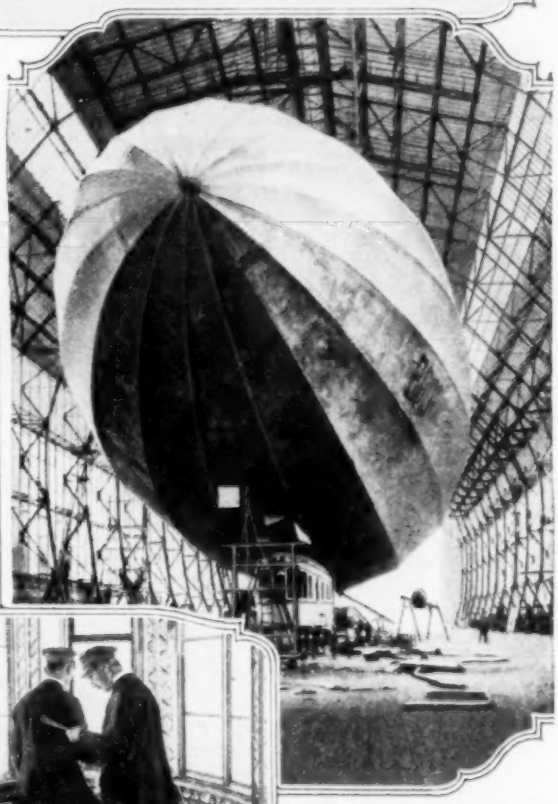
One of the Crew Stands at the "Bodensee's" Elevator Controls, Located with the Other Navigating Apparatus in the Forward Part of the Passenger Cabin. It Is with the "Bodensee" and Similar Airships That Germany Plans to Establish Air Routes to Athens, Lisbon, and Eventually to New York City. This Last Service may be Inaugurated within a Year



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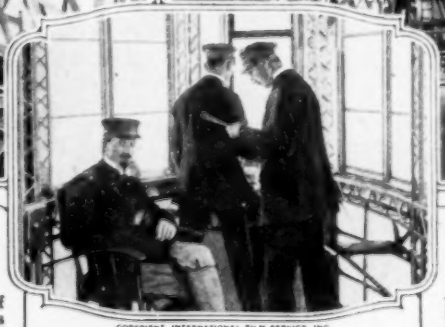
The Commercial Air Liner "Bodensee" is Here Shown in Its Hangar at Friedrichshafen. Though Only 325 Feet Long, the "Bodensee" Makes More than 60 Miles an Hour and Is the Last Word in Airship Construction. In Contrast to the Monster Naval Zeppelins of 1918, Driven by Six Power Gondolas, the "Bodensee" Carries Only Two



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Officers of the "Bodensee" are Shown in the Chart Room during the Maiden Voyage to Berlin. Officers and Crew Have Their Quarters in the Internal Keel

SOLDIER RECEIVES LETTER EIGHT MONTHS ON WAY

Stamped and scribbled on a battered envelope owned by a veteran of the great war is a veritable Odyssey of wandering

On His Return from Overseas a Veteran of the Great War Received This Letter. For Eight Months It had Followed Him to Hospitals and Casual Camps, Arriving at Every Station to Find Him Gone

and adventure. The letter was written by a friend in the United States and was intended to reach the soldier in France, but arrived "just too late." It missed him again and again at hospitals and casual camps. Opened once by mistake, it was given a wound stripe; another humorous mail clerk awarded it a stripe for six months' service overseas. Eight months after mailing, the letter reached the addressee, now back home.

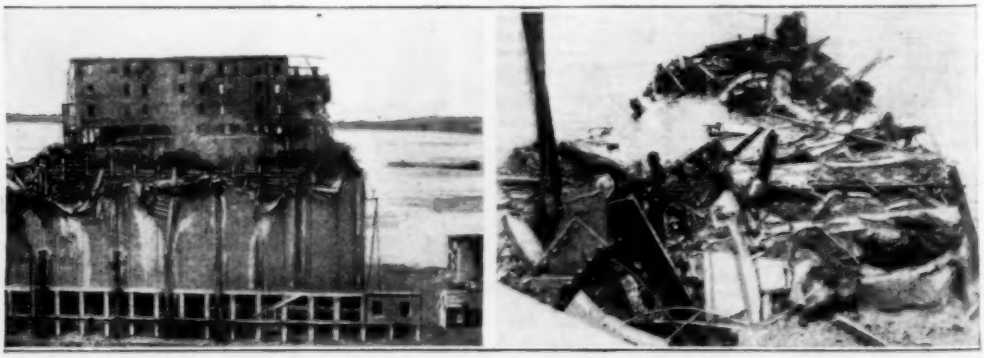
¶ To the war trophies now exhibited by the Smithsonian Institution at Washington, D. C., will soon be added the field kitchen which followed the former German kaiser on his trips behind the battle lines. It is noteworthy that the kitchen shows no sign of damage.

FISH LIVE LONG AS CAPTIVES, AQUARIUM RECORDS SHOW

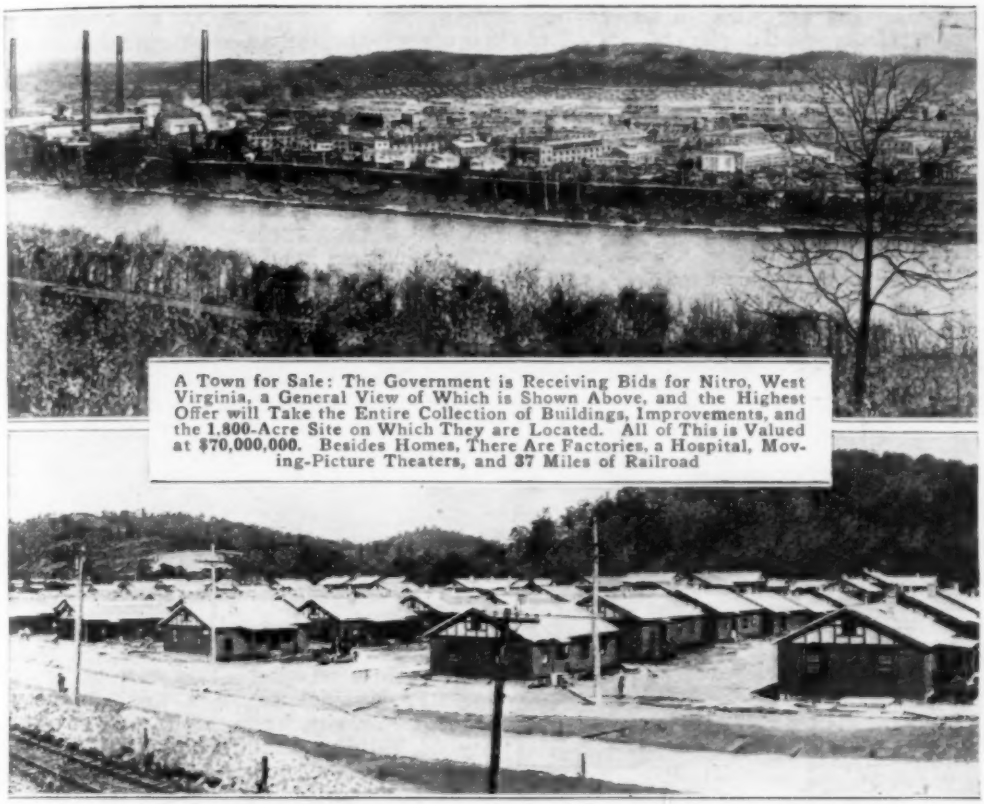
That captive fish, properly fed and cared for, may live a good many years in apparent contentment, is indicated by the records of the New York Aquarium. A pair of gar pike win the longevity contest with more than 20 years apiece, closely pursued by a channel bass with 19 years. A bowfin, better known as a fresh-water dogfish, was a tenant for 18 years. Extremely active and wide-ranging fish, like mackerel and herring, on the other hand, connot be kept alive very long. Many fish die from apparently insignificant injuries inflicted in their capture.

CONCRETE ELEVATOR EXPLODES AND WRECKS STEAMER

Despite its reinforced-concrete construction, a huge grain elevator at Port Colborne, Ontario, exploded a short time ago, wrecking its workhouse, killing eight persons, and injuring many more. Grain dust is assumed to have caused the explosion, which threw a column of dust and smoke a thousand feet into the air. The roof was blown some 200 ft. high, and portions of it were later found a mile away. A peculiar feature of the accident was the wrecking of the barge "Quebec," moored at the elevator, by a descending mass of débris. The steamer was saved by towing it onto the beach before it could sink. The big concrete structure, which cost $2,000,000 eight years ago, had a capacity of 2,000,000 bu. of grain, but was only about one-third full at the time. Grain was scattered far from the scene of the explosion, while the heavy walls of the structure were torn as though by a blast of powder.



A General View of the Wrecked Elevator can be Seen on the Left, While on the Right is Pictured the Barge "Quebec," Damaged by Falling Débris. Grain Dust is Assumed to have Caused the Explosion



A Town for Sale: The Government is Receiving Bids for Nitro, West Virginia, a General View of Which is Shown Above, and the Highest Offer will Take the Entire Collection of Buildings, Improvements, and the 1,800-Acre Site on Which They are Located. All of This is Valued at $70,000,000. Besides Homes, There Are Factories, a Hospital, Moving-Picture Theaters, and 37 Miles of Railroad

A Few of the 1,500 Workingmen's Cottages: During the War, These Sheltered Munitions Workers, but Now That Peace has Come, They Are Vacant. They were Erected by a Large Powder Company, and Later Taken over by the Ordnance Department

OFFER WHOLE CITY FOR SALE; COST SEVENTY MILLIONS

An entire city, with all modern facilities for the housing, employment, education, and entertainment of a population of 20,000, is about to be knocked down to the highest bidder. The town, Nitro, W. Va., is situated 17 miles from Charleston, on the Kanawha River, and has an excellent water and sewer system. It was built by a big powder manufacturer, at a cost of $70,000,000, to produce war munitions, but was later taken over by the government. It contains 1,500 houses for workmen, 75 residences suitable for executives, 737 factory buildings, a 24-room school, a 400-room hospital, and picture theaters; in fact, all the customary appurtenances of an up-to-date municipality, including 37 miles of railroad. The site covers 1,800 acres and is in the foothills of the Appalachian Mountains, which are visible on clear days. Included in the railroad equipment are a number of steam and electric locomotives.

AIRSHIP'S FABRIC LIFEBOATS INFLATED FROM BALLONETS

Running from bow to stern of every British rigid airship is a triangular-shaped corridor, or keel, which stiffens the hull structure and provides means of communication between various parts of

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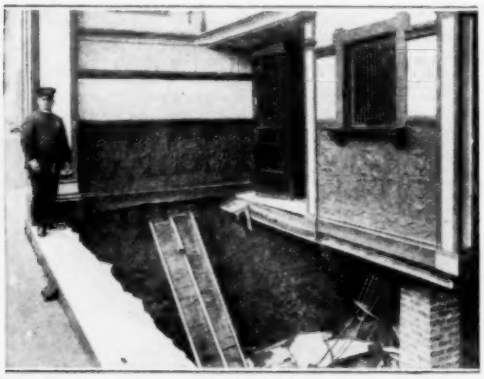
An Airship Being Unavailable, These Members of the Air Force are Demonstrating the Inflation of the Lifeboats Carried on the Great British Airships. Gas from the Ballonets Ordinarily Does the Job

the ship. On the sides of the corridor, hanging from special girders, are all the accessories, such as gasoline tanks, water-ballast bags, and parachutes. And now is added the inflatable lifeboat. In case of forced descent upon the water the lifeboats, filled with gas from the ballonets, are capable of carrying six persons.

ENTRANCE FLOOR COLLAPSES WITH THEATER CROWD

In the recessed entrance way of a Cincinnati picture theater, some days ago, 54 persons stood waiting for the second



The Gaping Pit into Which 54 Persons were Precipitated by the Collapse of the Theater-Entrance Floor: The Decayed Condition of the Wood Supports may be Seen

show and the signal to vacant seats. A moment later they had disappeared from view, and 15 ft. below a struggling mass of humanity trampled in panic frenzy. The tiled floor had given way under its four-ton load, and examination revealed that the wooden supports had rotted out at their end fastenings in the masonry. Some 30 persons were severely injured by the collapse, a contributing cause of which, in the opinion of local authorities, was the seepage of water from the scrubbing of the tile, decaying the wood.

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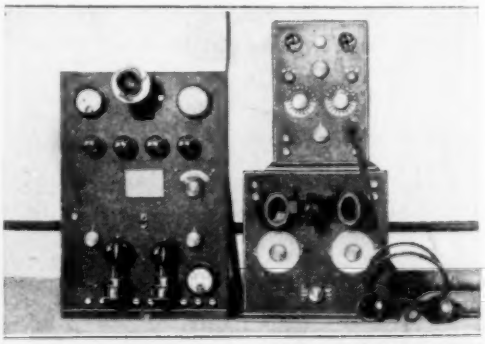

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Complete Radio-Telephone and Telegraph Set Which Uses Alternating Current, and for Operation is Plugged into a Lamp Socket: Transmitting Equipment at the Left and Receiving at the Right

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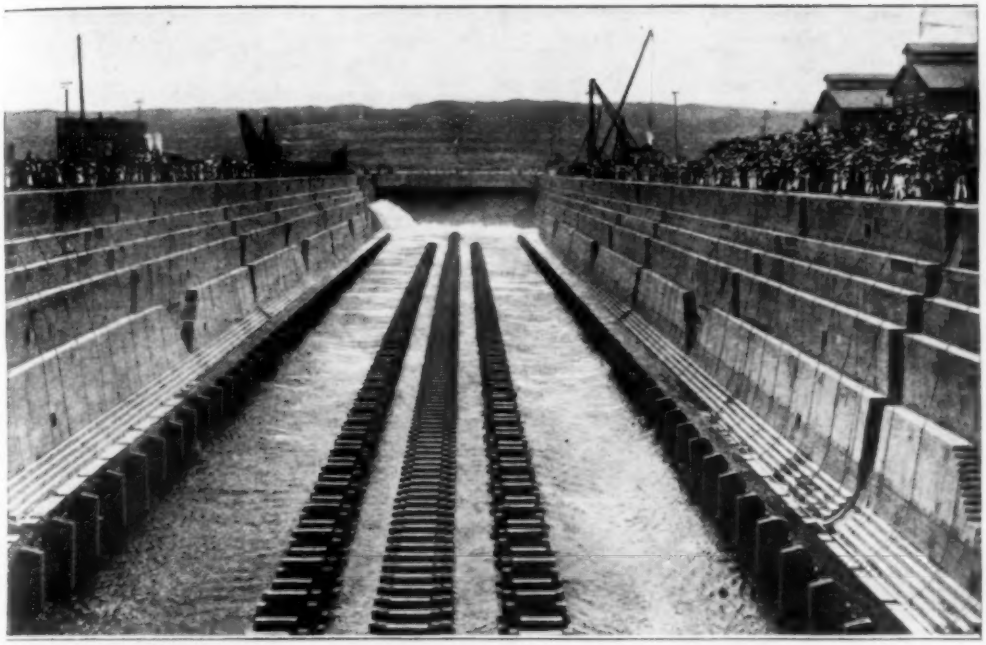

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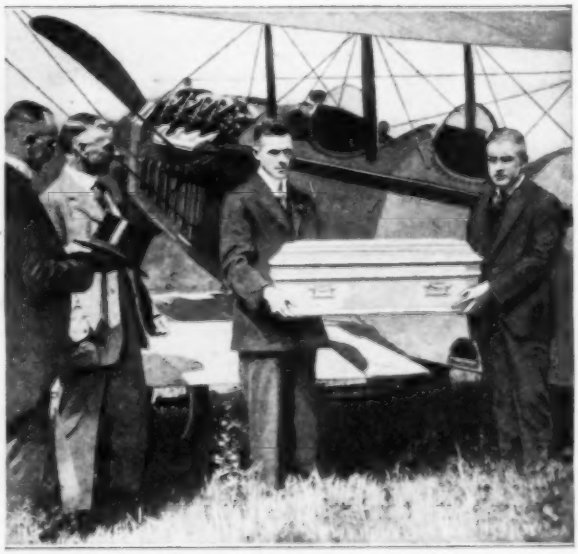

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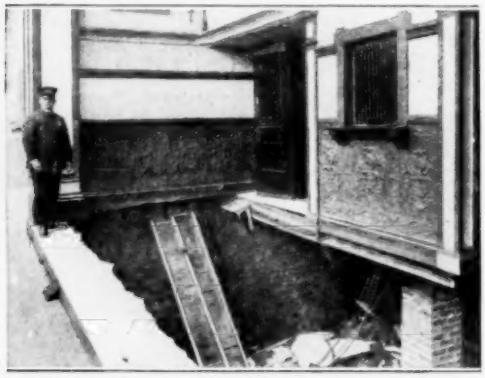

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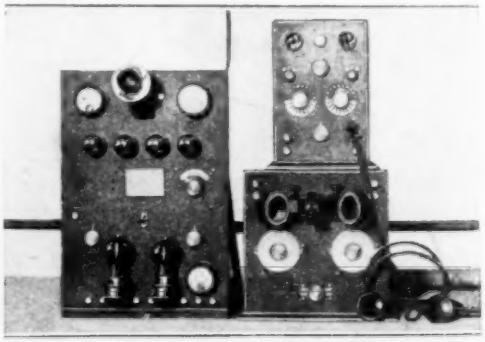

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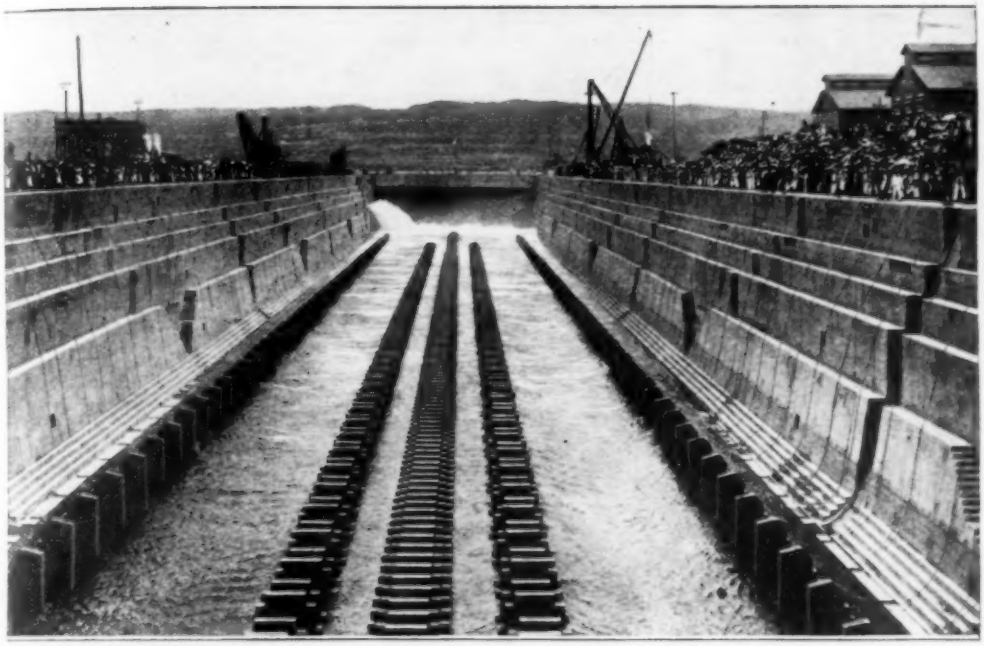

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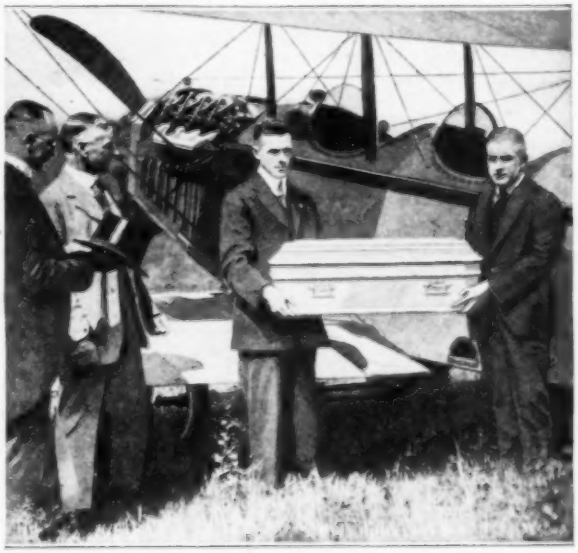

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PONTOON EQUIPMENT CHANGES AIRPLANE TO SEAPLANE

Combinations of wheels and floats to permit airplane landings on either land or water have usually been found more cumbersome than useful. As a successful compromise solution of the problem, however, a Canadian boat maker is now producing interchangeable pontoon equipment for the well-known Canadian training plane. To effect the transformation from landplane to seaplane the landing gear is removed and the pontoons bolted to the regular undercarriage fittings. At the hangar, the operation is easily performed in an hour. The auxiliary equipment is expected to find much favor in the forest-lake regions, where landing fields are few.

In Less Than an Hour This Airplane was Stripped of Its Undercarriage and Fitted with the New Pontoon Equipment for Flight over the Water. Speed is Not Materially Affected

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¶The slate waste of north Wales is to be utilized by a company of recent incorporation by turning it into asphalt, bricks, abrasive soap, glass, and linoleum.

MEASURE POWER OF LIGHTNING WITH IMPROVED APPARATUS

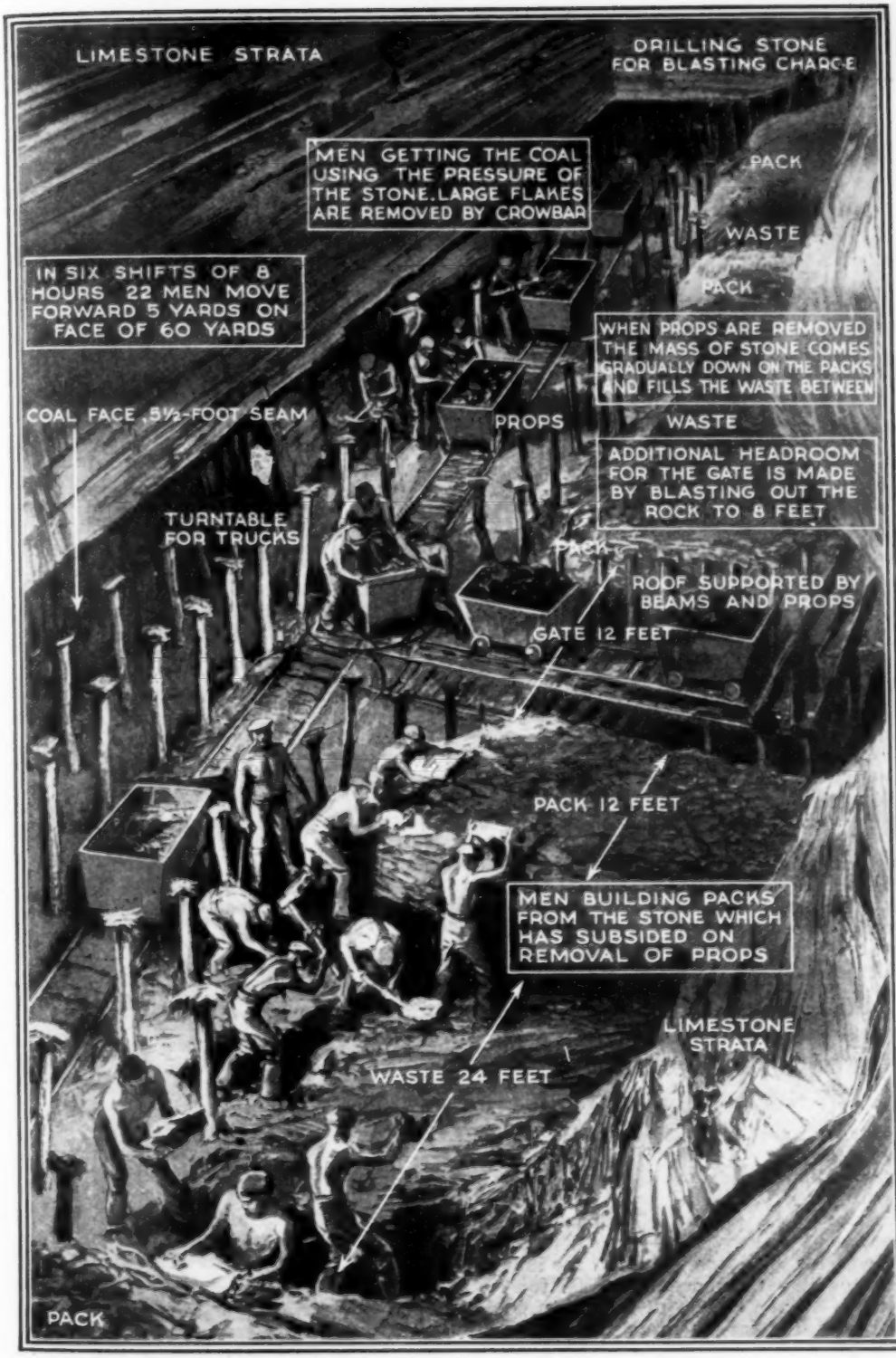
That the difference of potential resulting in a lightning discharge may reach the tremendous figure of 1,000,000,000 volts, and that this charge is distributed over a sphere some 2,000 to 2,600 ft. in diameter, is the conclusion derived from studies made with recently improved instruments in an English university. It is computed that a single discharge may dissipate as much as 1,000 kw. of energy. The new instruments include means for making a photographic record of electrometer readings, thus visualizing potential changes whose duration is less than one-tenth of a second. The results of the studies have encouraged a theory holding that processes like those which prevail in thunderstorms on earth are responsible for the emission of certain radiations from the sun.

CHANCE TO LEARN OPERATIONS OF SIGNAL CORPS OFFERED

Radio operators and telephone and telegraph men are in such great demand just now in the U. S. Signal Corps that an interesting opportunity is created for those inclined toward a technical career, with a taste for army life. Grammar-school graduates with an aptitude for electrical subjects, who succeed in meeting the other requirements, will be trained in the work of the corps, the supply of experienced men having proved inadequate.

POPULAR IDEA OF COAL MINING CORRECTED

The popular conception of coal mining as being confined to the ends of narrow tunnels is corrected by an artist's recent study of a large English mine. It is shown that the actual mining is done on a broad front of coal and rock, the tunnels being merely communication highways. The terrific pressure of the heavy limestone stratum above is utilized to open up the coal seams and aid the work of flaking off the coal. To keep this pressure within bounds, "packs" of stone are built, 12 ft. wide and 24 ft. apart. When the roof props are taken away, the huge mass of rock slowly comes to rest on the packs, and the miners hurry to load the coal before it is crushed by the tremendous weight upon it.

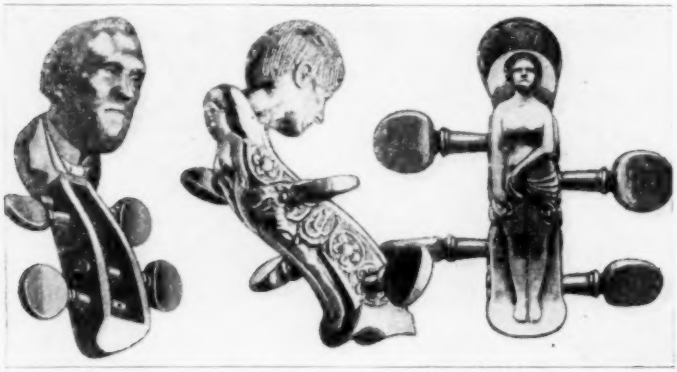

LIMESTONE STRATA
DRILLING STONE FOR BLASTING CHARGE
MEN GETTING THE COAL USING THE PRESSURE OF THE STONE. LARGE FLAKES ARE REMOVED BY CROWBAR
PACK
WASTE
PACK
IN SIX SHIFTS OF 8 HOURS 22 MEN MOVE FORWARD 5 YARDS ON FACE OF 60 YARDS
WHEN PROPS ARE REMOVED THE MASS OF STONE COMES GRADUALLY DOWN ON THE PACKS AND FILLS THE WASTE BETWEEN
COAL FACE, 5½-FOOT SEAM
PROPS
WASTE
ADDITIONAL HEADROOM FOR THE GATE IS MADE BY BLASTING OUT THE ROCK TO 8 FEET
TURNTABLE FOR TRUCKS
PACK
ROOF SUPPORTED BY BEAMS AND PROPS
GATE 12 FEET
PACK 12 FEET
MEN BUILDING PACKS FROM THE STONE WHICH HAS SUBSIDED ON REMOVAL OF PROPS
LIMESTONE STRATA
WASTE 24 FEET
PACK

FROM THE SPHERE, LONDON. COPYRIGHT BY THE NEW YORK HERALD

Artist's Study of a Coal Mine That Rectifies a Popular Misconception of Mining Methods: It is Shown That the Coal is Mined on a Broad Front, Instead of at the Ends of Tunnels, and That the Weight of Limestone Above is Used to Crush Out the Coal

REMARKABLE VIOLINS MADE FROM UNUSUAL WOODS

Materials of strange description contribute interest to the productions of an eccentric Ohio violin maker whose instruments are noted for their ornate carvings. Extremely simple tools are used by the workman, an old pocketknife with nicked and rusted blades being one of his favorite implements. In spite of this, the instruments have an excellent appearance and good tonal qualities. Wood taken from the heart of a partly petrified log, dug up in an eastern state, forms the back of one of the extraordinary violins. The log is declared to have been buried during the glacial period, and of course was centuries old when unearthed. Another unusual instrument has a back made from one of the drawers of a bureau brought to this country from England shortly after the historic voyage of the "Mayflower." Other pieces of antique furniture have furnished material for his violins.



These Remarkable, Carved Violin Peg Boxes were Fashioned with an Old Pocketknife by a Man Whose Hobby Is to Make the Instruments from Unusual Materials, Including Wood Taken from Antique Furniture, and the Heart of a Partially Petrified Log

CHRONOMETER WINS CONTEST BY RECORD PRECISION

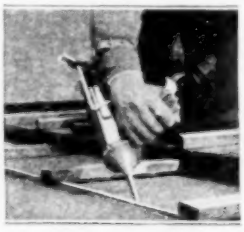
A chronometer which showed a variation from day to day of only six one-hundredths of a second won the world's record at the Geneva (Switzerland) Conservatory's latest annual contest. The method of scoring is by points, 300 being allowed for daily precision, 300 for immunity to temperature changes, 300 for resistance to the effects of changing position, and 100 for quick return to precision after such changes. In the contest 111 watch chronometers were entered, and five ship's chronometers.

PROCESS IMPARTS HARDWOOD SURFACE TO SOFT WOODS

A surface treatment for soft woods has been developed that not only imitates the appearance of hard wood but toughens it, and enables it to take a high polish, causing the treated surface to exhibit the actual properties of the denser substance. It is evident that the body of the treated board, being still soft, can be worked much more easily than a homogeneous piece of hard wood. To impart the hardwood finish, a great number of cuts, about a twelfth of an inch deep, are made in the direction of the fiber and in arrangement like the surface pores of the hard wood. Into this mutilated surface is then rubbed a paste composed of an oil, a mineral substance, and a coloring material. This paste hardens in the artificial pores, forming a "mosaic" which has the properties described.

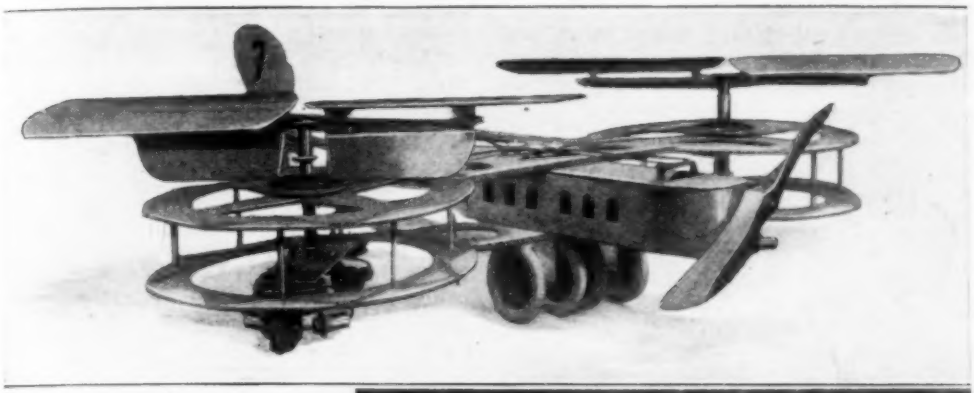
GREENHOUSE-GLAZING DEVICE RESEMBLES GREASE GUN

Plastic glazing compounds are so generally used for waterproofing greenhouse roofs, instead of putty, that devices for applying these preparations are natural developments. Perhaps one of the most ingenious is a contrivance which resembles a grease gun, and is designed to be manipulated with one hand. It is strapped to the forearm and operated by pressing a lever on the cylindrical container. This forces a stream of cement from a spout. Guiding the latter around a sash quickly seals a pane of glass in place. Glazing compounds are declared to be more durable than putty.

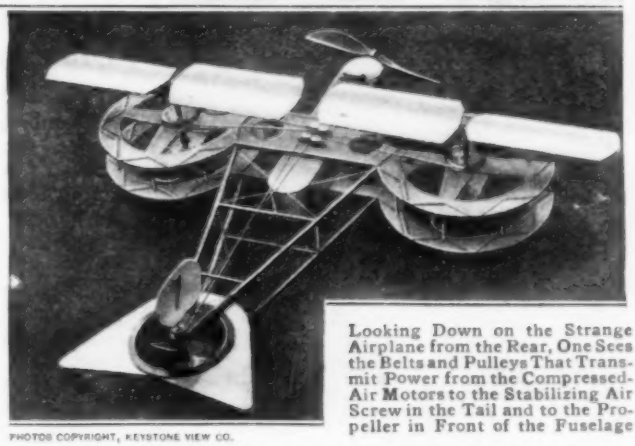


¶The performance of a freight steamer in carrying 15,316 tons of coal from Toledo, Ohio, to Gary, Ind., a few weeks ago, is hailed as establishing a new record in coal cargoes on the Great Lakes.

WHIRLING POWER PLANTS LIFT NEW HELICOPTER



This Front View of the Revolutionary Vertical-Rising Airplane Shows the Compressed-Air Motors Which Race around the Circular Tracks



PHOTOS COPYRIGHT, KEYSTONE VIEW CO.

Looking Down on the Strange Airplane from the Rear, One Sees the Belts and Pulleys That Transmit Power from the Compressed-Air Motors to the Stabilizing Air Screw in the Tail and to the Propeller in Front of the Fuselage

Before a well-known aeronautical society was recently demonstrated the model of a new helicopter, or vertical-rising airplane, which embodies several noteworthy departures in design. Speaking broadly, the machine is built on the lines of a conventional airplane. From the extremities of both wings, however, rise vertical shafts on which revolve the fanlike lifting surfaces, or air screws. A horizontal beam is fixed to the base of each of the two shafts. Attached to each extremity of these two beams is a motor which drives a traction wheel around a circular track. Each air screw revolves as the motors urge the wheels in whirling flight around the track. Thus the lifting screws are revolved with a power that could never be developed were they mounted directly on the engine crankshafts. In addition to turning the two major lifting surfaces, the whirling power plants transmit their power through belts and pulleys to a stabilizing air screw in the tail, and to a tractor propeller on the fuselage for forward motion.

The demonstration of this odd machine has reawakened interest in the whole problem of vertical-rising airplanes. The advantages of such a craft, if ever successfully realized, will admittedly be tremendous. It will be able to rise from and land on the most circumscribed areas. It will be able to drift with the wind, and in time of war will hover motionless over an enemy target while bombs are dropped by it with deadly accuracy.

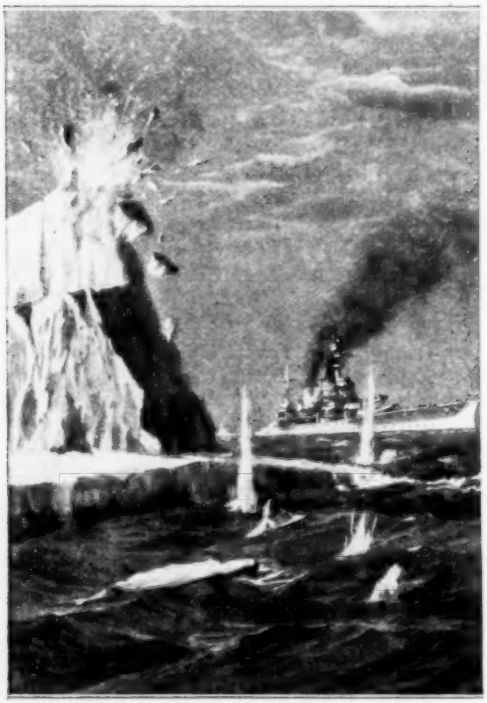
FINLAND PLANS SHIP CANAL BETWEEN LAKE AND GULF

Finland's new government is planning to make Lake Ladoga, situated between that country and Russia, accessible to large seagoing vessels. This will be accomplished by the construction of a canal which will connect the lake with the Gulf of Finland. The waterway will make it possible for ships plying the Baltic and North Seas to take their cargoes into the heart of the country without transferring the goods to railroads on the coast. Craft of 1,000 tons and more will be accommodated by the canal. Lake Ladoga has an area of 7,000 square miles. It is open for navigation about 180 days out of each year, being covered with ice during the remainder of the time.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

WARSHIP DESTROYS ICEBERGS WITH FOUR-INCH GUNS

Icebergs were cleared from the path of the British warship "Renown" by the vessel's guns during the recent voyage which



FROM THE SPHERE, LONDON, COPYRIGHT BY THE NEW YORK HERALD COMPANY

Demolishing Icebergs with Four-Inch Shells: In the Background Is the "Renown," Which Brought the Prince of Wales to America

brought the Prince of Wales to the shores of Newfoundland on his first visit to America. Volleys of 4-in. shells were fired at the larger floating mountains of ice, reducing them in a few minutes to fragments incapable of damaging the craft. Numerous bergs were sighted on the trip, the boat passing within 300 yd. of two at night. These were revealed by the ship's searchlights, and easily avoided.

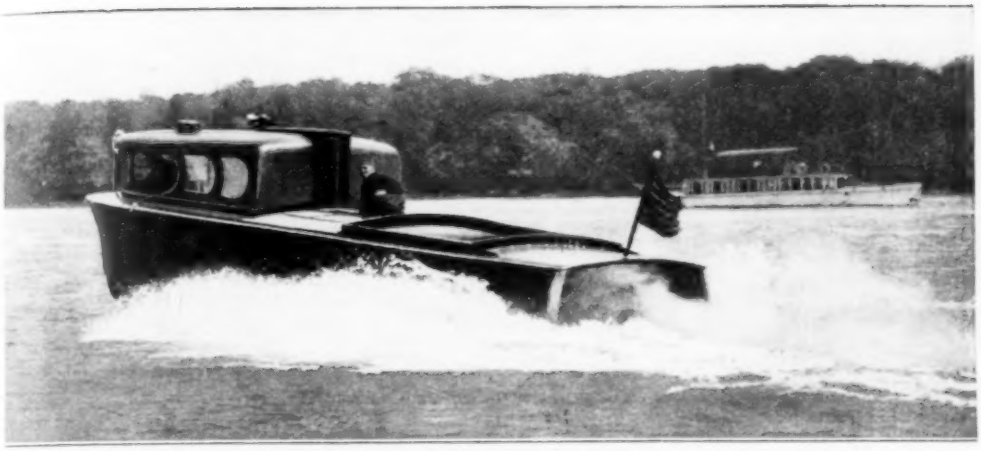
NAVY'S LARGEST SUBMARINE BREAKS SPEED RECORD

Speedy enough to cruise with a fleet of warships, and also suitable for independent operation, the "AA-1," the largest and swiftest submarine in the American navy, recently completed its trials off the coast of Massachusetts in a very satisfactory manner. Running on the surface, the boat made 24.08 miles an hour, establishing a new world's record for submarines propelled by a certain type of oil-burning engine. Submerged, the vessel attained a speed of 14.56 miles an hour. The most powerful motors of their kind ever installed in an underwater craft drive the "AA-1." These are capable of developing 4,400 hp., considerably more than the previous maximum, 3,600 hp., used in British and German submarines. The vessel is about 270 ft. long, and has a surface displacement of 1,150 tons. It is equipped with the latest safety devices and is heavily armed. Two other boats of the same type have been launched, and will be given trials in the near future.

MOUNTED POLICEMAN PURSUES QUARRY DOWN CELLAR STEPS

The volunteer policemen who lately guarded the streets of Boston often displayed an enthusiasm which proved as effective as it was refreshing. An example is offered in the act of a mounted patrolman who rode his horse into a basement butcher shop. He had given chase to a hoodlum who dodged and doubled in an attempt to "shake" his pursuer. The officer urged his horse close on the heels of his quarry, however, and at last forced him down a flight of cellar steps into the shop. Down the steps went officer and horse, to make an easy capture before the astonished customers. The fugitive was equally taken aback by such ruthless disregard for the proprieties.

Down the Steps and into the Butcher Shop Rode the Mounted Policeman When a Hoodlum Tried That Avenue of Escape during the Recent Riots in Boston



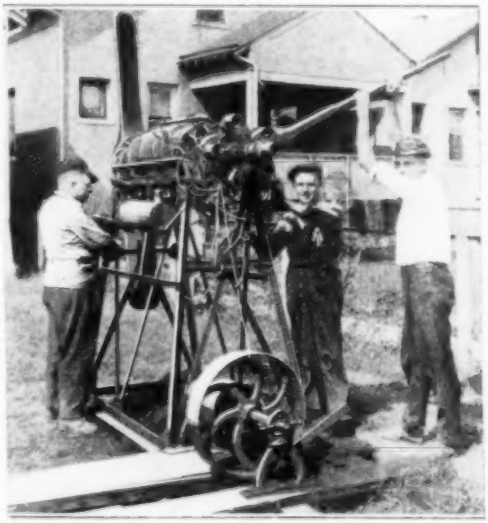
Capable of Traveling at the Rate of 40 Miles an Hour, This Motorboat Is Not Simply a Speed Craft. It is Equipped with Sleeping Quarters for Six Persons, a Kitchen, and a Toilet

SPEEDY MOTORBOAT EQUIPPED WITH CRUISING COMFORTS

It is not uncommon that motorboats built especially for racing exceed a speed of 40 miles an hour, but the attainment of that velocity by a gasoline-propelled cruiser, designed for comfort on long voyages as well as fast traveling, is a noteworthy achievement. Such an accomplishment is credited to a craft of the latter classification which was tested recently near Detroit. The boat is 36 ft. long and has a beam measurement of 9 ft. It is equipped with a 12-cyl. aviation-type motor, capable of developing 400 hp., and has a double hull which is described as nonsinkable. Sleeping accommodations for six persons are provided in a luxuriously upholstered cabin forward and a sheltered cockpit aft, while there are also a kitchen, a storeroom, and a toilet on board. During a trial the craft covered 35 miles in 52 minutes, which is at the rate of 40.38 miles an hour. On another occasion a speed of 39.45 miles an hour was maintained for 15 miles.

NEW GASOLINE POWER PLANT QUALIFIED FOR AERIAL USE

Peculiarly fitted for air-craft propulsion is a strange new gasoline engine designed by an American inventor. In shape and size much like a nail keg, it requires remarkably little space, hence develops little head resistance. In spite of the 465 hp. claimed as its rating, its weight is small (1.44 lb. per hp.). Freedom from vibration also recommends it for aerial use. Little can be learned about the workings of the odd power plant, as it is not to be produced in quantity until next year, but with regard to this last point the inventor explains that 20 power



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Out of the Mystery That Surrounds This New Gasoline Engine, Designed by an American Inventor, Comes the Information That It Works without a Crankshaft

impulses are imparted for every revolution, spaced at regular intervals of 18°. It is also revealed that the engine has no crankshaft.

¶In its investigation of grade-crossing accidents the railroad administration has found that the average passenger train obstructs a crossing less than seven seconds.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

LINCOLN'S PROFILE EMBOSSED ON TIN FROM OLD HOME

A sheet of tin stripped from the roof of Abraham Lincoln's old home in Springfield, Ill., bears a remarkable profile of the famous president, embossed with a hammer and punch by a workman who assisted in removing the original covering of sheet metal, when the residence was repaired not long ago. A frame was fashioned of the same material for the likeness. The house was occupied by the great emancipator at the time of his election to the highest national office, and is preserved because of its historical value.

TELEPHONE LINES IN INDIA NOW RUN LONG DISTANCES

Long-distance telephone lines in India have recently been greatly extended. A 600-mile line from Simla to Peshawar is finished, but needs modern equipment to be of commercial value. From Simla to Lahore a line over 300 miles long is now in regular service, as is a line west from Calcutta into the Chota Nagpur coal fields. An 80-mile Bombay-Poona line is in official use, though not yet ready for public service.

SHARK SEINES AID MARINE-LEATHER PRODUCTION

Faced with an alarming scarcity of hides, the world for some time has turned to the sea for a supply, with the result that a new industry is developing at various points on our coasts. Recently immense seines have been devised and used for the capture of sharks and other fish whose skins can be converted into leather. One of the nets that has proved very successful in this unusual fishing is 600 ft. long and 18 ft. deep, with a 4-in. mesh of heavy twine. It is operated from small boats, and as many as 200 sharks have been taken with it in a single day.

Experiments conducted under government supervision have disclosed the fact that tanned shark skins are suitable for shoe uppers and other articles. Five hundred fish skins are treated weekly at one tannery devoted to the production of marine leather, and plans have been made for greatly increasing this output during the next year. Each hide contains from 10 to 40 sq. ft. of exceptionally strong leather, and is sold at a price depending upon the quality. Valuable by-products are obtained from the flayed bodies of the fish, including fertilizer, glue, oil, and musical-instrument strings. The skins of certain whales, porpoises, rays, and devilfish also can be utilized. Formerly these inhabitants of the sea were regarded as worthless. Now they are expected to become important factors in the leather market.

Seining Sharks: At the Left One of the Monsters has been Hoisted into a Boat and is being Disentangled from the Net. A Hammerhead Shark, Fresh from the Sea, is Shown at the Right

Placing the Great Seines in the Water Is No Easy Task. Made of Heavy, Tarred Twine, the Nets Are 600 Feet Long and 18 Feet Deep, with a Four-Inch Mesh

Small Boats, Equipped with Cranes, are Used by the Shark Fishermen. This Picture Shows a Sand-Bar Shark, Captured in a Seine, Being Lifted from the Sea

Now and Then a Clumsy Loggerhead Turtle Wanders into the Big Seines, and is Made a Captive by the Shark Hunters. The Shell of This One is Covered with Barnacles

Properly Tanned, the Skin of This Salt-Water Monster will Provide Material for Many Pairs of Shoes or Other Articles Usually Made from the Hides of Land Animals

Though Related to the Shark, the Ray, or Devilfish, does Not Resemble It. It is Found in Large Numbers in the Warm Waters off the Coast of Florida, and can be Captured in Seines

As Many as 200 Sharks have been Caught in One Day with the Seine Depicted Here. It is Floated by Corks, Five Inches in Diameter, Placed at Two-Foot Intervals

A Dangerous Specimen: One Blow from the Powerful Tail of This Huge Tiger Shark would Break the Crane, and Possibly Capsize the Boat. Therefore, Great Care must be Exercised in Hoisting the Enormous Fish Aboard. Until the Discovery That Its Skin could be Utilized, This Shark was Hated and Feared

PATENTED CONCRETE HIGHWAY BUILT IN THREE STRIPS

Conservation of material and labor is possible in the construction of concrete highways built according to plans recently invented and patented by a resident of Jacksonville, Fla. Instead of the usual single wide strip of smooth surface, there are three strips in the new road. A center strip, 5 ft. wide, is flanked by two strips, 2 ft. 6 in. wide, with intervening ground space. The three strips are bound together at regular intervals by buried reinforced concrete. At necessary points, drainage pits are built underneath the surface of the road. Water that collects in these is carried away by 8-in. tile. Two vehicles can pass without difficulty on the strips.

Three-Part Road in Use: Vehicles can Pass One Another without Leaving the Strips, Which Require Less Material and Labor to Build Than an Ordinary Concrete Highway. An Intersection Plan is Shown in the Insert. This Method of Construction was Devised by a Southern Inventor

ALARM BELL GIVES WARNING WHEN CAR IS STOLEN

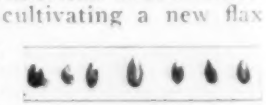
Driving a stolen automobile is made a noisy, and therefore dangerous, operation by a novel device which has been placed on sale in England. Inclosed in a box intended to be fastened underneath a car is a bell and a ringing mechanism, designed to sound a loud alarm when the machine is moved, and to continue to do so until the vehicle comes to a stop. A strong lock protects the contents of the box. It is necessary to open the latter to set the contrivance or to render it inoperative.

ODD FORMS OF ARMY TRACTOR RECOMMENDED BY OFFICERS

Among the new forms of army equipment whose development is declared necessary by a board of officers appointed to study the question, are three types of tractor distinctly novel and quite out of the ordinary. One is a small endless-tread machine without power, to serve as a wagon drawn by two men, the tongue acting as a lever to turn the wheels with a ratchet when necessary. Another, a little larger and engine-driven, would be operated by a man on foot, and used for carrying heavy machine guns, ammunition, and men, and for laying wire. The third would practically replace the horses of individual mounts, carrying two men. It would be low, about 40 in. wide, the flexible tread being 8 ft. long and 6 in. wide, and with an engine operable under all possible difficulties.

NEW DOUBLE-SIZE FLAX SEED YIELDS LIMPID-WHITE OIL

Inspired by the pleas of French artists for an oil that would not dull their pictures, a noted American horticulturist has succeeded in cultivating a new flax of unusual quality. The seeds of the developed plant are almost twice the size of those of the ordinary variety, are a limpid white in color, and yield about 12 per cent more oil. The experimenter started with a few seeds of light-brown East Indian flax, which for several years reverted to the dark shade; but from this unpromising source was finally developed a plant quite as productive as the old, and with the other advantages. Some $33,000,000 worth of flax seed is produced every year in America.



¶A London factory owner believes himself the first to use an airplane engine as an ordinary power unit. Only a small part of the rated horsepower is used.

FIGHT FIRE IN BIG COAL PILE WITH PORTABLE CONVEYORS

WHEN a 16,000-ton storage pile of coal in a Maine coast yard caught fire a short time ago, all the sea water the fire boats could throw on it with twin nozzles failed to extinguish it. The salt water made the installation of coal-handling machinery useless. In the emergency, resort was made to some small portable belt conveyors. A 30-ft. conveyor was hung from an adjacent trestle, with its lower end near the coal pile, and a 60-ft. conveyor, mounted on adjustable trucks, was used as an extension. With this improvised equipment, and as many as 15 men shoveling, the coal was quickly removed, and the fire, deprived of sustenance, soon became confined to a relatively small area, and reduced to a point where extinguishing it was a comparatively simple matter. The ingenious expedient thus saved time, machinery, and coal.

GRASSHOPPER TRAP CRUSHES PESTS BETWEEN ROLLERS

Mechanical assistance is now available for the farmer in his struggle to eliminate the destructive grasshopper, as a Wisconsin inventor has patented a device for trapping and killing the pests. The front of the contrivance, which is intended to be pushed across a field, presents a highly polished metal screen, slightly inclined backward in a rigid frame. Grasshoppers jumping against this obstacle are unable to obtain a footing on it and slide into a trough below. At the bottom of the trough a narrow opening admits the insects to a chamber lighted from above by a screened aperture. Crawling toward the light on cleats provided to facilitate that feat, the pests reach two moving rollers, actuated by a geared traction wheel at the rear of the device, between which they are crushed, and then dropped into a removable drawer underneath the rollers. The resulting mass may be fed to poultry. The device is made in sections, and several sections can be bolted together at their ends. Any suitable motive power may be employed. Enormous losses are caused by the insects, which appear in vast numbers in some states.

Grasshopper Trap: The Traction Wheel Actuates Rollers Which Crush the Insects. At the Right can be Seen the Polished Metal Screen

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

EXPLOSION DAMAGES HOUSE BUT SPARES WINDOWS

Inexplicable results were produced by a gas explosion which occurred recently in the home of a minister in a Michigan

Residence Damaged by a Gas Explosion: Though a Gable End was Blown from the Building, No Windows were Broken by the Blast

city. A gable end was blown from one side of the dwelling, and dropped to the ground beside the house, where it remained in an upright position. Strangely, a window in the gable end was not broken, nor were other panes in the building damaged. The blast is believed to have been caused by a spark from an electric-light switch, though this theory is not generally accepted.

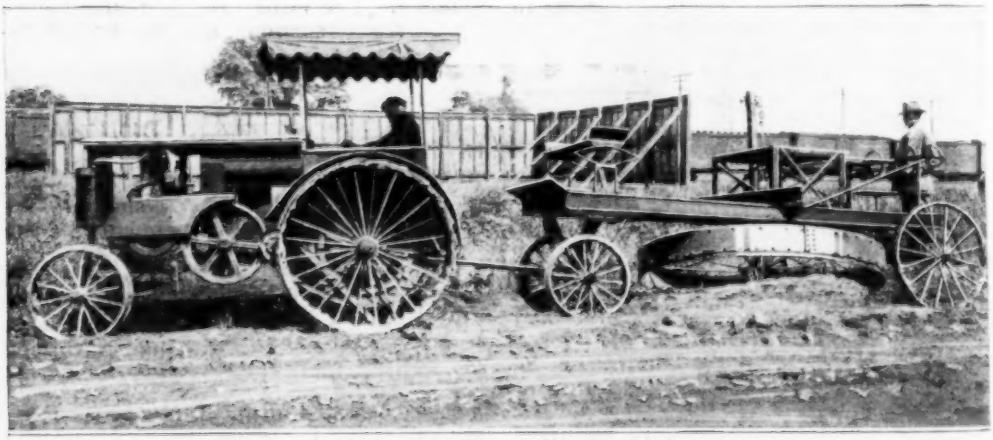
¶ Sprinkling whitewash on the surface of a carload of coal is the Chinese method of discouraging theft. The vigilant eye of the watchman easily detects the slightest disturbance of the contents.

CONNECTED ELECTRIC SYSTEMS COVER VAST TERRITORY

Coöperation between neighboring electric-service companies, which in its concrete meaning involves many technical problems, has been carried to an extreme in the West. Final connections have just been made which establish a composite hydroelectric system covering five great states—Oregon, California, Nevada, Arizona, and New Mexico. While other groups of service companies are larger in the number of units supplied, none, it is declared, covers so vast a territory. Some 12 generating concerns are parties to the interconnection, which comes as an outgrowth of conservation measures adopted during the war.

ROAD-GRADING MACHINE HAS BIG WHEEL FOR SCRAPER

A road-grading machine whose scraping member is a big steel-rimmed wheel on a vertical axle, instead of the usual stationary blade, has been developed by a Kansas inventor. The scraper wheel, the standard size of which is 12 ft., is slung beneath a four-wheeled carriage which is drawn by a tractor. Handwheels at the rear adjust the scraper wheel to any desired angle with the road. The 12-ft. wheel moves dirt 11½ ft. across the grade. The advantage of the wheel form of scraper is that no "waves" or ridges are formed in the soft surface of a new road, the rotating blade leaving a smooth and uniform path. It is also asserted that the new system is more rapid and requires less power than the old.



Road Grader with Rotary Scraper: The Big Horizontal Wheel Hanging below the Bed of the Machine Revolves as It is Drawn along the Road by the Tractor, Making a Smooth, Uniform Grade. The Handwheels Regulate Angle and Depth

TO THE POLE VIA AIRPLANE

By Howard Egbert

THE airplane will unveil the mysteries of the Arctic, and Vilhjalmur Stefansson, explorer, will blaze the way to the frozen North, likely in a specially prepared flying machine which his good friend Orville Wright of Dayton, Ohio, will set about to design.

"The pole can be reached by the airplane route, I feel confident," said Stefansson, following a special trip made to Dayton not long ago for the purpose of conferring with the inventor.

This visit, by the way, was a long time coming. The explorer and the inventor had never met personally. After leaving, in May, 1913, to make arctic researches for the Canadian government, nothing had been heard from Stefansson when the winter of 1914 arrived. Appeal was made by Canadian officials to Orville Wright, then living in semiretirement at his home in Dayton, for help by building an airplane that might penetrate the polar regions and either bring back the intrepid adventurer or discover where lay his grave in that northern land.

Orville Wright considered the proposition, but at that time could see no way in which a polar expedition by air could be successfully carried out. He kept the thought in mind, however, but later, when Stefansson turned up safe and sound, the matter was dropped.

Now this appeal of long ago will bear fruit. The explorer has become seriously interested in aviation as a means of reaching the polar circle, and scientists have made up their minds that such a thing is not only possible but practical. Hence the next great arctic adventure in the cause of science will be made with an airplane.

"The aerial journey to the Arctic is a thing to be still worked out," said Stefansson. "The airplane, of course, which we shall use in such a venture, must be of the seaplane type, able to rise from the water safely and speedily; descend, when necessary, either upon the ice-bound lands of the polar zone, or in whatever bodies of water we may sight and have need to rest upon. To rise from the water, an airplane must have great speed and unobstructed surface. The northern lakes and watercourses are invariably filled with floating ice, and the pontoons of the ordinary seaplane, unprotected against an encounter with the ice, would be smashed and rendered useless. Perhaps, after all, the chief use the airplane would have in such an expedition would be as an auxiliary to the exploring party. It may be that a seaplane can be sufficiently protected to permit it to safely encounter ice floes, for instance by providing the machine with a sharp cutter which would break the force of a collision between the machine and the ice pack.

"Experiences with planes in crossing the Atlantic have been of unusual service to the world of science. Exploration and aviation must go hand in hand in the future. The one is largely dependent upon the other, and if the airplane fails, not much additional light can be thrown upon unexplored regions."

In his earlier work in the Arctic, Stefansson has depended largely upon the use of dogs. "The St. Bernard, crossed with the Eskimo dog, makes the finest animal in the world for sledge work in the north," he says. "A pure-bred St. Bernard is not so good because his feet are tender, and they are apt to chafe on a hard run. Eskimo dogs are not so good because they do not have the inherent courage which is necessary. A mixture of the two breeds produces the ideal animal for our kind of rough work.

"An Eskimo dog is a quitter when not properly fed, or from the moment he begins to tire. If his dinner is late on a long, hard run, he is apt to lie down, and all the coaxing and beating in the world will not budge him into action. It is not pleasant to whip dogs. A St. Bernard, however, has a wonderful spirit, much like that of a man who has a knowledge that a certain work has to be done and who will apply himself, despite his weariness, even to the going for days without proper food and rest."

The trip to the north pole by airplane, even with an experienced pilot and mechanicians, would be hazardous enough, Wright and Stefansson agreed at their meeting. The cold, cutting winds of the Arctic would probably soon force even an extraordinary airplane to come down, because engine trouble would be encountered with the first stiff gale. To provide against this, the first thing the inventor will have to do is to devise protection for a superengine.

The wings and frame of the proposed arctic airplane would have to be made of unusually tough fiber, to enable the machine as a flying body to withstand the stubborn winds and storms of that part of the world, and the protection of the pilots would, of course, be no small matter to be considered. Pilot cages would have to be built and electric warmers installed, to keep pilots and navigators, and other members of the party, fairly comfortable after the first jump into the frozen North.

The airplane itself, scientific men agree, would have to be, above all things a supermachine, particularly designed and built, light enough to fly, but heavy enough to defy the extraordinary climatic conditions.

MOTOR AND SPINDLE ON ARM OF NEW RADIAL DRILL

Several features distinguish a new electric radial drill from the ordinary type of this device. One is the arrangement of the drill spindle and the driving motor, which are mounted at opposite ends of a swinging horizontal arm, sliding through a clamp on top of an upright column, and are connected by a flat belt. The latter can be adjusted by varying the position of the motor, for which provision is made. Different speeds are obtained by the use of graduated pulleys. Work can be placed on the base of the machine, on a table which is adjustable as to height, or on temporary stands at any point near the drill. A push-button switch controls the motor.

New Type of Electric Radial Drill: The Driving Motor and Drill Spindle are Mounted at the Ends of a Swinging Horizontal Arm

HOT-WIRE TELEPHONE IS USED BY ARMY AS RANGE FINDER

Using the principle of the hot-wire telephone receiver, discovered some years ago, a British army officer designed a range-finding microphone which proved of great service in war work, and is now to be developed for possible commercial use. The apparatus is simple, consisting merely of fine wires supported in the neck of a bottle and heated by electric current. Distant gun discharges produce air fluctuations which momentarily cool the wires, their contraction giving rise to characteristic sound waves. The range is found by triangulation between two of the microphones.

¶A hotel for dogs and cats was opened a short time ago in London to care for the pets of persons leaving the city temporarily.

TWO LIBERTY MOTORS JOINED TO MAKE 24-CYLINDER MODEL

The sensational development of the Liberty airplane motor continues despite the end of hostilities. The War Department has now combined two of the standard 12-cylinder models to make a 24-cylinder unit of 673 hp. The combination was effected quite simply by the use of connecting rods of special design, and two regular crank-case upper halves, one being somewhat altered. The monster engine is not a freak; tests at one of the aviation fields show a gasoline consumption per horsepower only slightly greater than that of the "12." It was found, too, that the "24" weighs 1.97 lb. per horsepower as against 2.11 for the smaller engine.

BOYCOTT OF GERMAN GOODS URGED WITH DOORMAT

German-made goods will not find a ready sale in this country if the views

There Is Little Encouragement for German Manufacturers in This Mat, Which Lies in Front of a Pennsylvanian's Door

of a Pennsylvanian, as expressed on a doormat, are shared by all Americans. Painted on the shoe cleaner is this terse admonition: "If You Buy German-Made Goods, Don't Wipe Your Feet on This Mat."

UMPIRE'S CHAIR FILLS EVERY NEED AT TOURNAMENT

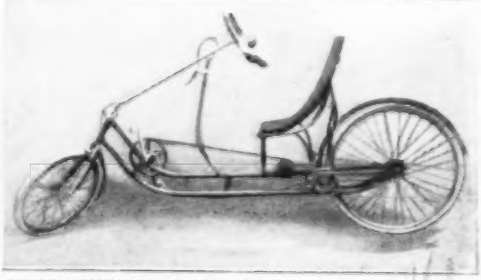
Ordinarily unnoticed, a humble umpire's chair created a sensation all its own at the recent national lawn-tennis tournament. The "chair" was really a cabinet raised five feet from the earth by stout wooden legs. On top sat the umpire; within were compartments and drawers containing every article of possible use in the play. One "pigeonhole" contained rackets; others held balls, sweaters, and towels. The designer pointed with particular pride to the drawer containing his

Players in the Recent National Lawn-Tennis Tournament were Delighted with This Umpire's Chair, Which Contained Emergency Equipment for Every Imaginable Use

emergency kit, comprising scissors, safety pins, aromatic spirits of ammonia, adhesive tape, sawdust, shoe laces, resin, chewing gum, a hammer, sliced lemons, and a number of other things.

FRENCH BICYCLE STEERED LIKE AUTOMOBILE

The simple "bone shaker" of 50 years ago, proud of its wooden frame and wheels, would never recognize as its descendant a luxurious bicycle which has lately appeared in France. Discarding all conventional notions, the manufacturers have seated the rider in a comfortable "reclining chair," placing before him, as in an automobile, the steering column with warning horn and hand brake. The strange vehicle is peculiarly fitted for travel over smooth city boulevards.



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Lounging in the Padded, High-Backed Seat, the Rider of This French Bicycle Pedals along the City Boulevard in Absolute Comfort

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

SQUEEGEE MACHINE REMOVES WATER FROM FLOORS

Adapting the window-washing squeegee to floor cleaning is accomplished in a novel machine for removing excess water from floors that have been mopped or scrubbed. Rubber blades are fastened in a V-shaped frame which is carried by a three-wheeled hand truck. The end of a rubber hose, connected with a pump, bears lightly on the floor surface at the angle of the frame. Chains from the rear wheels of the truck drive the pump, which sucks the water collected by the scraping blades to a tank that is an integral part of the device.

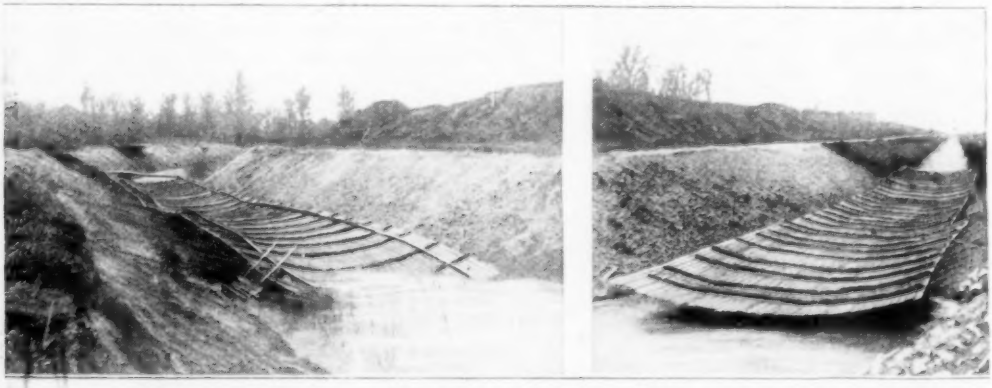
Water Collected by the Rubber Blades of This Floor Squeegee is Transferred to a Tank on the Machine by a Chain-Driven Suction Pump

AIRMAN SPIRALS TO FLOOR OF YOSEMITE VALLEY

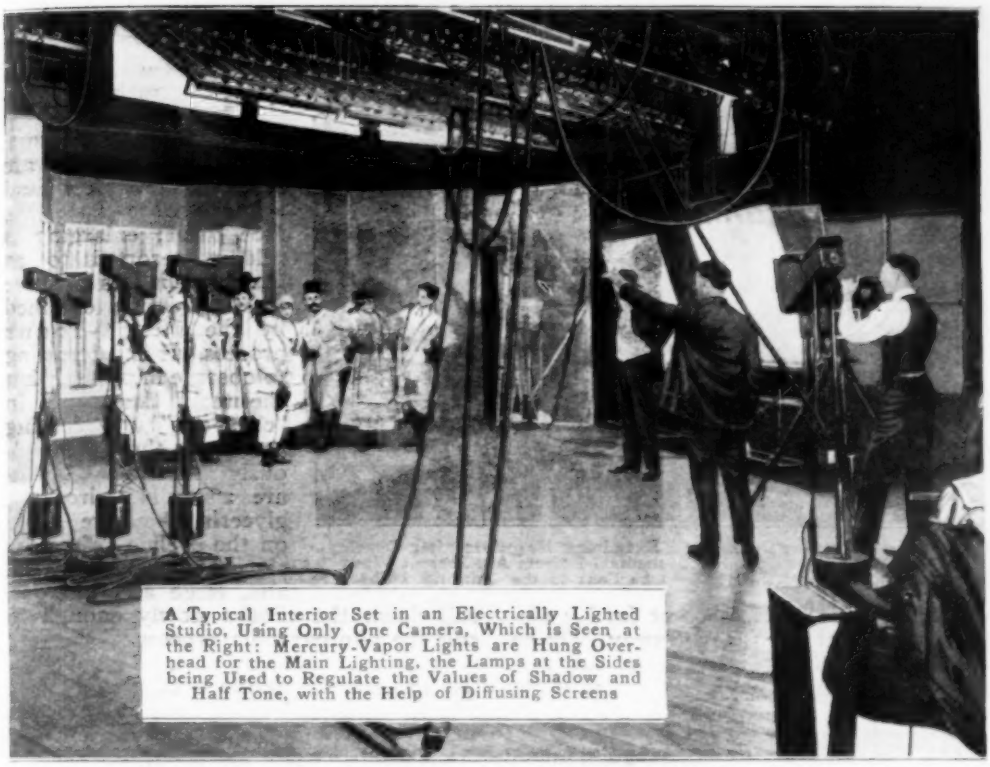
A spectacular flight to the floor of Yosemite Valley was recently made by an army airman detailed to the California fire patrol. Leaving San Francisco at 6 a. m. in a heavy fog, he flew the 180 miles to Yosemite in just 100 minutes. Arriving above the spot selected for the attempt, the cañon being here roughly a mile high and a quarter of a mile wide, the airman started his descent at 11,000 ft., banked his machine on passing the lips of the cañon, and spiraled thence to the floor. Even here failure was close at hand, however, as telegraph wires, trees, and a large crowd of spectators made landing a delicate task. The airman was received by park officials and presented with a gold medal for his achievement.

BOARD FLOOR ON RIVER BED STOPS CHANNEL EROSION

Flooring a river channel with boards is rather an unusual method of stopping erosion, but it has proved successful in the Little River drainage district of Cape Girardeau County, Mo. The velocity of the current in a narrow channel at the east end of the system was so great that the banks and bed of the stream were rapidly being washed away. Along the offending section heavy wires were stretched across the river, a short distance apart, and secured to anchors buried in the banks. The flooring, or mattress, was built of 12 to 16-ft. boards, lapped to 50-ft. lengths. Sections, six boards wide, were placed on the wires, and the whole laced firmly together to a width of 40 ft. The upstream end, weighted with rocks, was anchored with heavy cables, and as the big mat submerged, the wires tightened, and the current flowed over its new bed. The whole 300-ft. length of the mattress was riprapped to protect the banks.



The Mattress of Boards, Laid to Form a Floor on the River Bed, is Seen at the Left as It Is Beginning to be Submerged; at the Right All of the Completed "Floor" Is Visible, Showing the Manner of Construction



A Typical Interior Set in an Electrically Lighted Studio, Using Only One Camera, Which is Seen at the Right: Mercury-Vapor Lights are Hung Overhead for the Main Lighting, the Lamps at the Sides being Used to Regulate the Values of Shadow and Half Tone, with the Help of Diffusing Screens

WHAT MAKES THE FILM GO 'ROUND

By LLOYD D. LEWIS

EVERY month there are enough moving-picture films sent to theaters to reach, if pasted in a single strand, halfway around the world. And this is most certainly an absurdly low estimate of the output of the laboratories that grind night and day, spinning out the material for the greatest system of amusement that the world has ever known. It is the estimate that the leaders of the business, laconic, hard-thinking business men, put upon their industry. All admit that it represents only the minimum of the regularly established concerns. Scores of independent concerns in out-of-the-way corners are printing pictures on which no figures are obtainable.

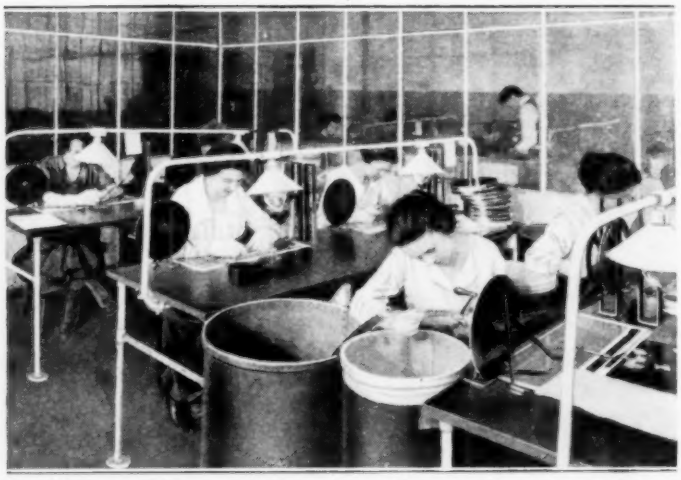
Vague as is the figure, 65,000,000 ft., it will suffice to give an idea of how enormous, mechanically, the moving-picture business has become. In point of capitalization now the fifth industry in America, it is one of the most interesting scientifically. And certainly the most romantic and popular so far as its players are concerned, it is "behind the screen" one of the most intricate technically.

For one's interest, it must be admitted, is in Charlie Chaplin's feet, and Mary Pickford's curls, and Bill Hart's six-shooter, not in the men who toil in the dark rooms handling thousands of feet of film an hour, and yet, today, the principal cause of the tremendous popularity of the picture show is the mechanical perfection of the completed films.

When a director has finished "shooting" the hero and heroine, the work has only begun. Months must elapse before the public sees the picture. Days must be given to the development of the negative, weeks to the printing of copies, and still more weeks to the coloring and arrangement of the film before it is ready for the public.

Usually 150,000 to 200,000 ft. are run through the cameras to get a six-reel, or 6,000-ft., picture. The director stations three, four, or five cameras to take the same scene. He has one camera close beside the struggling villain and hero, another grinding from an elevation, still another at this angle, one more at that angle. When all of these negatives are

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.



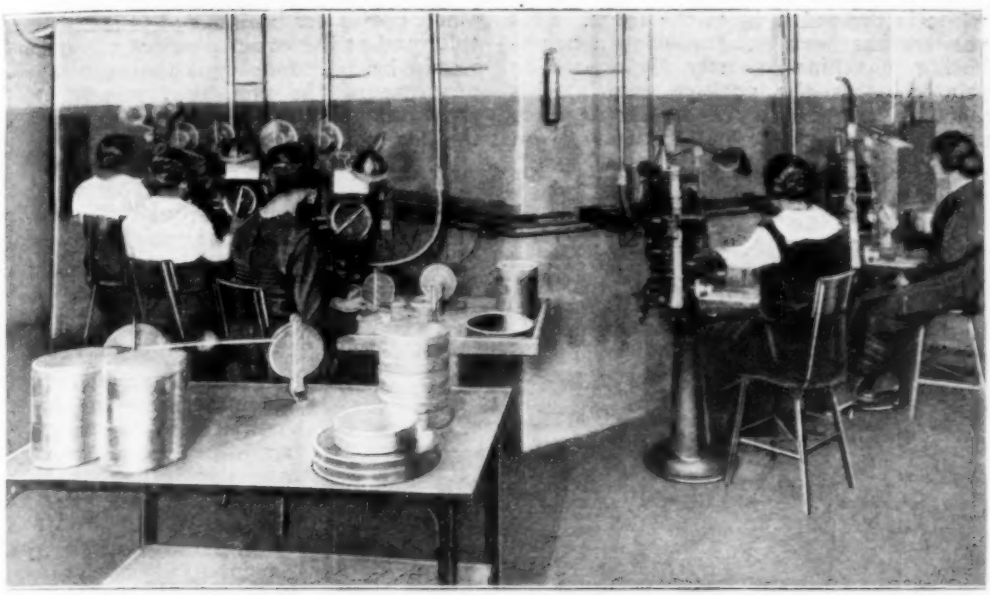
Girls in the Inspection Department Examining Negatives after Development, to Make Sure That No Mechanical Defects Are Present When They Leave the Laboratory to be Sent to the Printing Plant

developed, he selects the best for his picture. The rest are thrown away. Or he may, and usually does, combine a few feet of this film, with a few of that, and make his finished picture a thing of greater variety.

"Close-ups," as the large views of actors' faces are called, are made a few feet and even inches from the face itself; enlarging is seldom resorted to as the result is less effective than a picture obtained by the short-focus process. It is interesting to observe in passing that the tears that show in "close-ups" of weeping actresses—those marvelously realistic tears—are usually drops of glycerin which are placed on the eyelids before the camera begins clicking, and, large and lustrous, roll down the cheeks slowly enough to suit the photographic process.

When the story has been recorded by the camera, the sections of the negative

In the Assembling Room the Short Lengths of Film, Representing the Various Scenes of the Complete Film, are Patched Together by Girls, Who Work According to the Instructions of the Director, Inserting "Leaders" and Cutting Out Overlapped Scenes. The Insert Shows One of the Operators Cutting the Film before Cementing It



Automatic Film-Printing Machines: The Right-Hand Reel on Top of Each Machine Contains the Negative, the Left-Hand Reel the Positive Stock. The Exposure Period is Set with a Dial on the Front, which is Adjusted to Suit the Particular Printing Qualities or Requirements of Each Piece of Negative

that are to be used in the completed picture are shipped to the printing laboratories, many of the California companies sending their negatives to a laboratory in Chicago, whose central location makes it a natural distribution point.

Along with the film sent to the printing establishment goes a descriptive text from the director, giving instructions as to which scenes are to be given, and also sections of film bearing the subtitles, or "leaders," which have been drawn and painted by artists and then photographed at the studios.

Huge insurance, often running as high as $200,000 or $250,000 apiece, is placed upon these original films, known as "master negatives." It is extremely important that no accident or even atmospheric change affect this negative, for if it is harmed, the whole costly process of photographing must be gone through again.

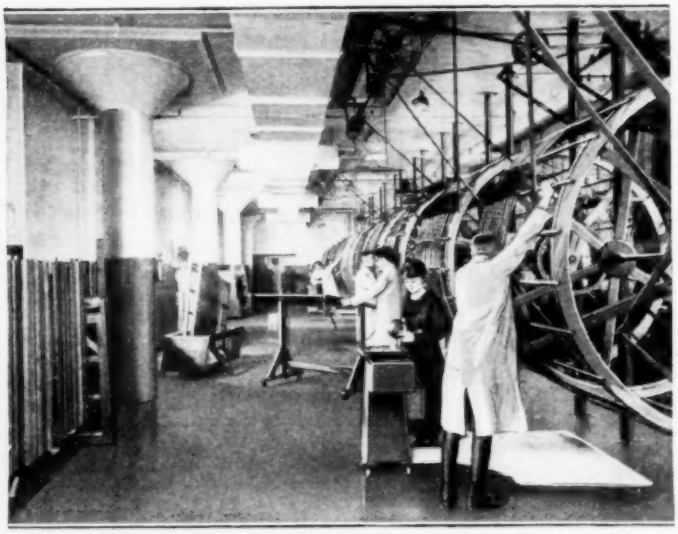
The printing factory is a sealed and carefully tested building. Its interior is kept at a uniform temperature, about 78°, summer and winter. Even the heat radiating from the bodies of the employes is considered and taken into account in regulating the artificial heating of the room, for the gelatinous nature of the raw film requires the most exact care, or it will melt or harden and render a film useless for exhibition. Similarly, every ounce of air that enters the building is washed by running water, for a speck of dust might otherwise alight on a precious negative, ruin the facial expression of the starring actress, and cost the picture its "punch."

After expert cutters have assembled the pieces of the master negative according to the directions, and inserted the subtitles at the exact points scheduled, the film is sent to the printing room, where copies of it are made. It is the copies, never the original negative, that one sees in picture houses. The master negative is too precious to be intrusted to the handling of an indifferent operator.

Of the average film, 50 to 75 prints are made, but in the case of one of the most popular cinema comedians, as many as 250 to 275 prints have sometimes been required. When repeated inspection has assured the laboratory superintendent that the negative is according to directions, he has it carefully washed and cleaned and then sent to the printing room, with detailed instructions how long to expose each picture; when to change the time to catch the sunlight scenes; when, to catch the midnight-ride scenes, and when, to show the hero feeling his way through the blackened cave.

At the printer's left hand is a reel of "positive stock," which appears milky

white in the red light of the room. This positive has been perforated on a neighboring machine shortly before. The printer starts the positive entering his machine at one slit, the master negative at another. Electricity draws them through, turning tiny sprockets in the machine's interior. Passing before a strong light within the machine, the positive has every image of the negative photographed upon it. It emerges and is reeled up and carried off to the developing room, while the negative is reeled back onto its stand at the printer's right hand and is ready to be used on the next reel of positive.



In the Drying Room, the Developed, Fixed, and Washed Prints are Wound on Great Drums and Rotated Until the Films are Perfectly Dry

It is especially important that static electricity be absent from this printing room, for its presence will cause fine, irregular lines to appear in the film, which may sometimes totally ruin it.

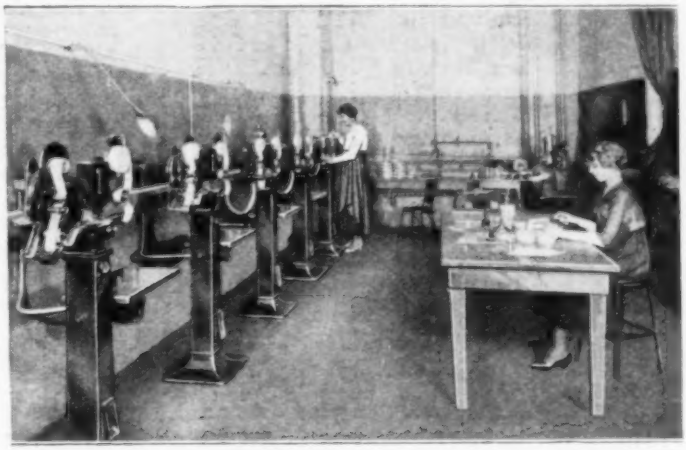
Passing from the printing room, the positive is unreeled and wound about a rack, so that it does not overlap or touch in any of its sections. Cut into lengths of about 400 ft., it is moved automatically down through vats containing the developing fluids. These liquids are kept in constant circulation, and at a constant temperature. Emerging from the first vat, expert workmen lift the positive out, and place it in open baths, permitting it to remain for a certain period, the time of which is exactly told by electric lights that flash on when the rack enters and off when the time is up. At certain times the developer and washes drain away. Their usefulness has been chemically foretold, and at the exact moment when they would become dangerous to the best appearance of the film, they run off and fresh fluids fill the containers. All through the various fixing baths this mechanical precision is maintained. The water enters the plant through five filters, each of which is guaranteed to take out all impurities. The character of the water is chemically tested, and it is treated to remove its hardness, which causes air bubbles to spring up in the film. It would be an object lesson to any amateur photographer to observe the painstaking care with which the washing processes are executed in moving-picture work. Hundreds of times, it seems, the racks are agitated in fresh water, over and over again, until all hypo and silver salts are removed. When the time is up, the racks are set up before strong red lights and experts go over the positives to detect, if possible, the slightest irregularity in photography or printing. When pronounced perfect, the film is sent, by dumb-waiters, to the floor above, known as the drying room. There it is placed on a specially constructed stand and reeled onto huge wheels, which whirl rapidly in a light, even-temperatured room until the last atom of moisture is removed from it. Each of these great lath drums will dry 4,000 ft., or four reels, of film an hour. A perforating machine will prepare some 28,000 ft. per hour. A printing machine cannot be so easily timed, since some scenes require much longer time than others, and a series of interior scenes demand longer exposure than a sequence of, for instance, snow pictures.

When the film is to be tinted or toned, it goes to the color room before it ascends to the drying room. Experts, long schooled in the art, are the only workmen who are intrusted with the tinting and toning processes. In the tinting work the whole picture is stained, while in the toning certain parts are touched to differentiate them from the rest of the scene. When the negative leaves this

color room and goes onto the drying drums, night scenes are blue, sepia interiors amber, pure black-and-white sunlight scenes gray.

At the moment the film is thoroughly dry, it is reeled off into a compact roll again, a specialist standing at its side, scrutinizing each foot of it to detect any errors that might have escaped other inspectors. If poor photography is evident, that section is clipped out and an order sent through for a "repeat." The printing machine sends that part of the master negative through again, the strip comes down the line, and, if perfect, is simply glued into the positive at the proper point.

In these laboratories, corps of chemists are working constantly on new hypos and developers, seeking to find solutions that will give novel effects to the films. Stereoscopic pictures are certain to be developed in the near future, but beyond that event, the principal artistic progress of moving pictures will be made in new chemical treatments and solutions which will heighten the pictorial value of the scenes. That these experiments are productive of interesting and valuable results has already been demonstrated on the screen, where each innovation makes its début as soon as it is perfected.

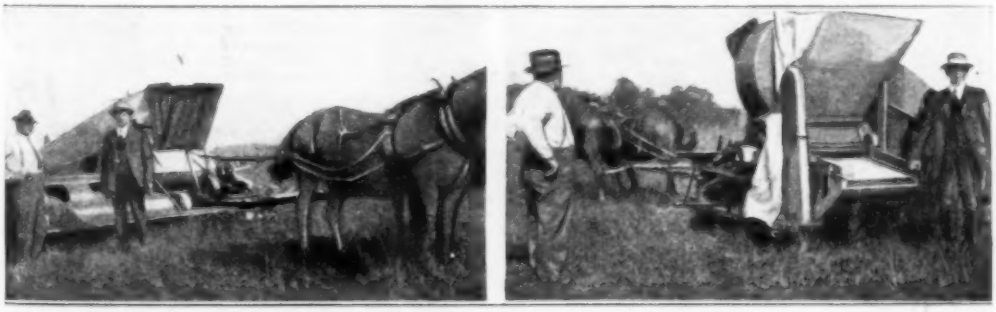


Automatic Perforating Machines Make the Holes along the Edges of the Unexposed Film Stock, to Fit the Sprockets of the Camera and the Projecting Machines in the Theaters. Only Nonactinic Light is Allowed to Enter This Room. The Film, When Purchased, Has No Perforations

HARVESTER FOR CLOVER SEED PICKS RIPE HEADS ONLY

A large harvesting machine for clover seed that picks only the ripe heads, leaving the green plants for later gathering, has been invented by an Indiana farmer. A revolving brush knocks the hulls out of the ripe heads by striking them against a table, which also helps to remove the dust. The suction of a fan picks up the hulls, and after the seeds have been extracted in a separating drum, a blast of air driven up through a screen blows out the remaining dust. The harvester may be operated repeatedly over the same field, as the seed continues to ripen. It is drawn by a team of horses or a small tractor, requiring comparatively little power for so large a machine.

¶A British highway engineer has computed that 85,720 pairs of old shoes are necessary for every mile of dustless road made of a patented slag, rock, asphalt, and scrap-leather composition.



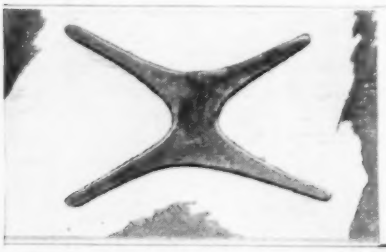
Left, Front View, and Right, Back View of Clover-Seed Harvester Which Takes Only the Ripe Heads, Leaving the Green Standing for Another Day: The Seeds are Knocked Off by a Brush and Picked Up by Suction

HUGE STATUE IN CITY PARK WELCOMES VISITING FLEET

A heroic statue of the traditional "Uncle Sam" formed part of the decorative scheme which helped to enliven Los Angeles at the time of its recent welcome to the new Pacific fleet. With arms crooked in characteristic sailor fashion, Uncle Sam smiled down, from his height of 25 ft., on thousands of sight - seeing officers and sailors from every state in the Union. The statue was given a position of prominence, being placed at the entrance to Pershing Park in the heart of the business district. Comparison with the figures at the base reveals its size.

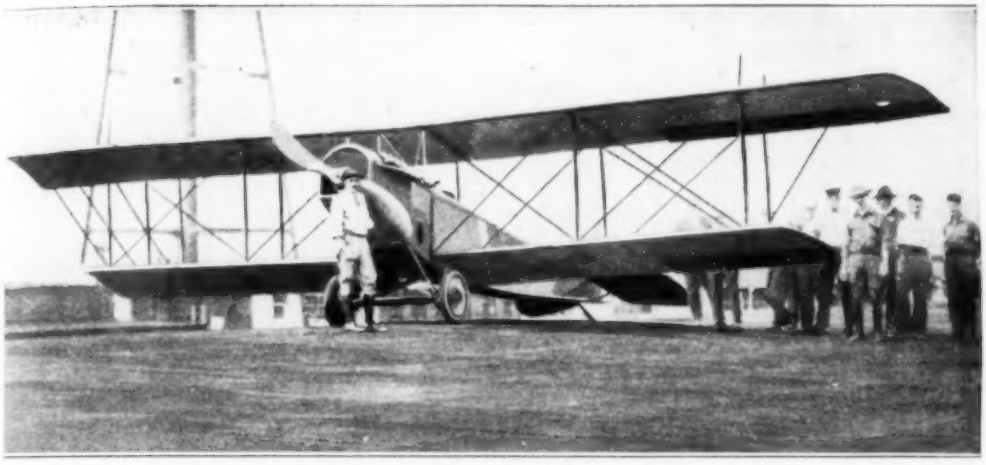
OBTAIN IMPORTANT TRINKETS IN MOUND-BUILDER'S TOMB

Digging into the tomb of a mound-builder chief near Newark, Ohio, scientists recently discovered ancient trinkets which they declare establish the fact that the stone-age inhabitants of the locality belonged to the same tribe whose earth monuments are found in other parts of the state, notably Ross County, where similar research work has disclosed surprising evidence of prehistoric culture. The sepulcher is located near the flint quarries from which aborigines obtained material for arrowheads and other implements. It is made of small stones, and buried in a circular mound of earth, about 13 ft. high. The chief's skeleton indicated that he was a man nearly 6 ft. tall, and over average weight. Underneath the bones was found what is considered the most important article taken from the excavation, a copper gorget, believed to have been a token of authority or rank. Other objects of interest were copper earrings, an armlet of the same material, and beads made from sea shells, which evidently had been worn as a necklace. Every part of the tomb was carefully examined by the researchers.



Great Importance is Attached to the Ancient Copper Gorget, Pictured on the Left, Which was Taken from the Tomb of a Mound-Builder Chief, near Newark, Ohio. It is Supposed to have Been a Token of Rank or Authority. The Bones of Its Owner were Carefully Uncovered by Scientists

Interior of the Tomb, Showing the Skeleton: In the Vicinity of the Burial Place are Located Numerous Stone-Age Flint Quarries



This Picture was Taken in the Few Minutes between the Airplane's Descent on and Ascent from the Roof. This, the First Performance of Its Kind in the World's History, was Done with No Previous Planning or Preparation. The Air Being Quiet, the Airman Was Able to Bring His Plane Down Squarely on the Peak of the Sloping Roof. The Take-Off Was No Less Hazardous, Yet Equally Successful

AIRMAN LANDS AND TAKES OFF FROM BUILDING ROOF

A Frenchman was the first to land an airplane on a roof; but America claims the first airman to both land and take off from such a limited surface. The performance was altogether unpremeditated, being resolved upon while the airman was flying above a quartermaster building in Newark, N. J. Spiraling down, he straightened out just above the roof which slopes gently on both sides of the peak. He gauged his position nicely and was able to plant one landing wheel on either side of the rooftree. When his plane had rolled to a stop, the airman had it pushed backward to the farther end of the roof. Here it was held by a number of spectators until the signal to "let go" was given, when the plane dashed down the rooftree and took to the air just a few feet from the other end.

ROARING TORCH OF OIL GAS BLAZES HIGH IN AIR

A terrifying torch of natural gas, its roaring flame leaping 300 to 400 ft. into the air, was the phenomenon that followed a recent drilling in the California oil fields. The gas was ignited, presumably, by a spark when some flint bowlder, ejected by the enormous pressure, came into contact with the steel casing. As a night spectacle the huge blaze, lighting the fields as bright as day, attracted great numbers of visitors, including an army of birds and insects. The method of extinguishing such fires is to blow them out with steam, and pipes from 20 boilers had to be run to this one, the men working behind shields to protect them from the intense heat. The derrick and drill pipe, of course, were destroyed in the first burst of flame.

Burning Gas Well with Flame 300 to 400 Feet High: The Wreckage of the Derrick and Drill Lies at the Foot, the Square Objects Being Shields for the Workmen

DRIVEWAYS TO THREE FLOORS OF NEW HOTEL GARAGE

Driveways on different levels make it possible to drive automobiles into entrances to all floors of a modern three-story hotel garage recently completed in an eastern city. The building is located on the side of a steep hill, with one end partly buried in the earth. Little labor was required to make the driveways, which are like huge steps in the slope, each one at the height of a floor. The lowest has a slight downgrade toward the garage, the second is nearly level, while the third has a barely noticeable upgrade. Three hundred cars can be housed in the structure.

Built on the Side of a Hill, with One End Partly Buried in the Earth, This Three-Story Garage Has Driveways Leading to All Floors. In the Background Is the Hotel to Which It Belongs

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The notorious Moroccan bandit, Raisuli, is taking photographs of his battle scenes, in modern style; and now he is looking for a motion-picture photographer to record the movements of his uprising. So far the adventurous camera men have not crowded the opportunity, remembering that many enter the Raisuli stronghold, but few emerge.

GERMAN BATTERY IN BELGIUM HAS INTERESTING POINTS

Artillery installed by the German forces along the coast of Belgium is being studied with considerable interest by military students. The most powerful battery, one of the North Ostend group, consists of four 15-in. guns, each over 56 ft. long. The big guns pivot on ball bearings, and are aimed horizontally by a rack and pinion driven by a chain from an electric motor hung below the carriage in a steel cradle. A great sliding nut on a huge inclined screw elevates the barrel, this too being operated by a motor hung from the opposite side of the carriage, and working through a two-speed change gear shifted by a hand lever. Both motors drive through clutches, giving fairly accurate ranging, which is completed to precision by handwheels.

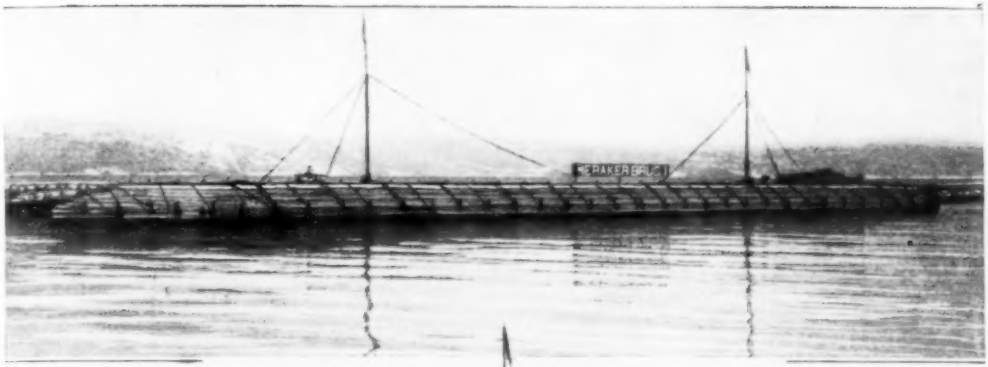
ARMY TRUCKS BREAK BRIDGES ALONG WESTERN HIGHWAY

Within a 400-mile length of the Lincoln Highway through Wyoming, the long train of army trucks now on its way across the continent broke through a total of 47 different bridges. One of the objects of the trip was to demonstrate that some of the country's highway provisions are inadequate to the severe demands of military work. The broken bridges were promptly reconstructed by the engineers who accompanied the train for that purpose. Their collapse was no reflection on their design, for they were amply strong for tourist traffic.

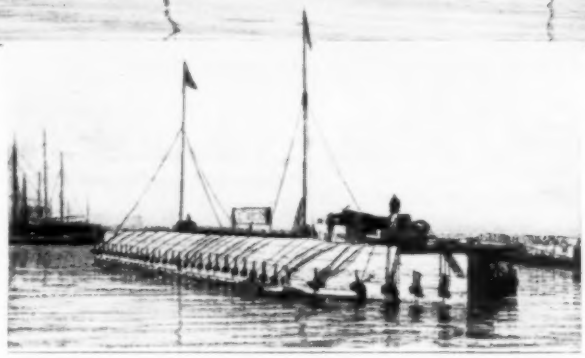
SHIPLIKE LUMBER RAFT TOWED LONG DISTANCE

A gigantic shiplike raft, containing thousands of feet of sawed lumber, recently was towed from Hommelvik, on the coast of Norway, to Harwich, England, with the loss of only a few timbers en route, in spite of rough weather. The trip of over 1,000 miles was made in eight days behind a 1,200-hp. tug. Two electric cranes and a large force of men were kept busy two weeks disassembling the great mass of wood, which was 360 ft. long, 40 ft. across, and 18 ft. thick. Comparatively few pieces were water-soaked, and none was actually damaged by the long voyage.

Constructing the raft was no small task. The first step was the building of shipways on the beach at Hommelvik. Heavy crossbeams were laid between the ways and parallel with them on blocks



Broadside View of the Great Lumber Raft as It Appeared Just before Starting on Its Long Voyage from Hommelvik, Norway, to Harwich, England



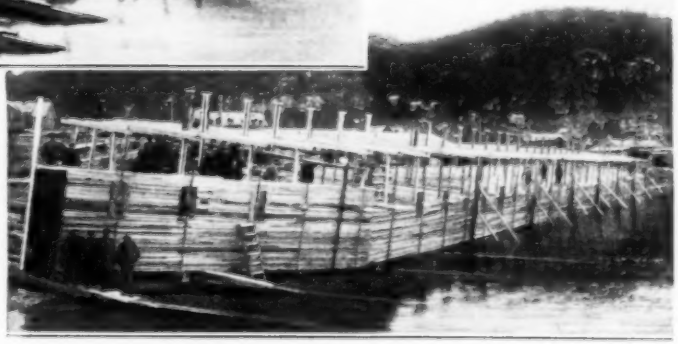
In This Picture can be Seen the Pointed Prow of the Raft, and the Cabin. The Latter Is Located Forward of the Foremast, and will Accommodate a Crew of Eight Men

Firmly Bound Together with Bolts and Cables, This Ship-Like Collection of Timbers was Towed 1,000 Miles with the Loss of Only a Few Boards

that held the timbers level with the latter. To the beams a double floor of planks was nailed, and around the floor was erected a 6-ft. wall of boards, brought to an acute angle at one end to form a prow, and fashioned to resemble the stern of a vessel at the other. Lumber was laid in the crude hull, with ends overlapping, to a height of 6 ft., before the half-completed raft was launched. Six feet more were added to the thickness of the load at a wharf.

Bolts running through the raft from the ends and centers of the crossbeams, and through similar timbers laid across the top of the raft, held the boards together. Springs were placed under the nuts on the bolts to allow for expansion. Over the upper crossbeams more lumber was laid, to form a convex surface. This portion of the raft, which might be called the deck cargo, was fastened to the upper crossbeams with steel cables and center bolts.

Near the bow end of

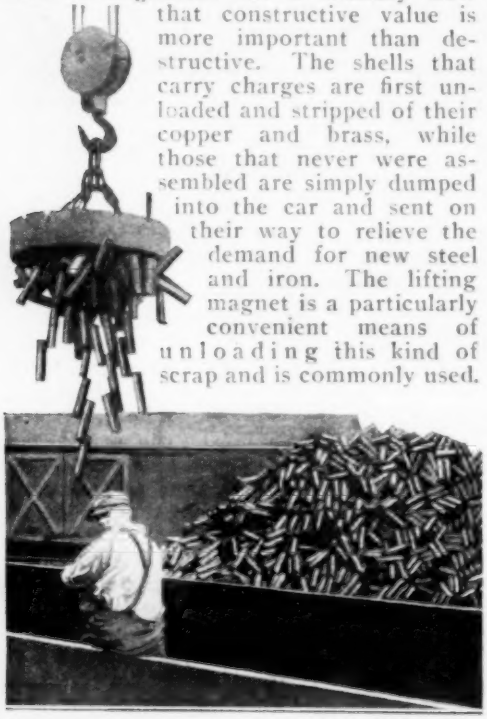


Building the Raft: Above are Shown the Ways, with the Partially Completed Floor upon Them. At the Right, the Sides Are in Place, and the Hull is being Filled with Timbers. Soon After the Latter Picture was Taken, the Raft was Launched

the raft a cabin was built, projecting about 3 ft., and capable of accommodating eight men. A rudder was placed in a steel frame at the stern, and steering gear was installed in front of the cabin.

TONS OF DISCARDED SHELLS ON WAY TO FOUNDRY

A carload of big-gun shells is no unusual consignment for a foundry now that constructive value is more important than destructive. The shells that carry charges are first unloaded and stripped of their copper and brass, while those that never were assembled are simply dumped into the car and sent on their way to relieve the demand for new steel and iron. The lifting magnet is a particularly convenient means of unloading this kind of scrap and is commonly used.



Carload of Discarded Shells being Unloaded with a Lifting Magnet at a Foundry Where They were Sent to be Metamorphosed into Machines and Implements

ADULT DAY SCHOOL EXTENDS WORK OF EVENING CLASSES

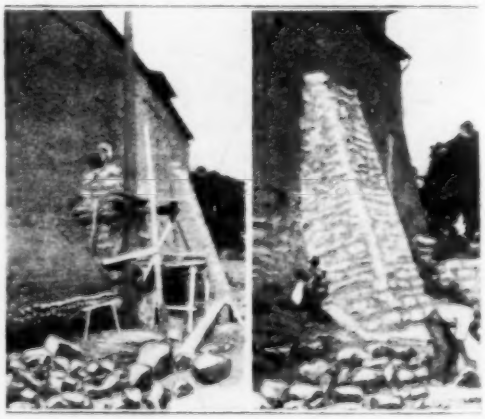
In establishing evening classes for foreigners, and other adults anxious to fit themselves for American life, city authorities have commonly made no provision for the large number of workers who labor at night. In Chicago, however, the Board of Education has seen the need and now provides free instruction at the Haven school, located near the loop, both morning and afternoon. Foreigners may here learn to speak, read, and write the English language, or may prepare themselves for application for citizenship papers.

ORE SHIP'S GAS-FILLED HOLD SCENE OF HEROIC RESCUE

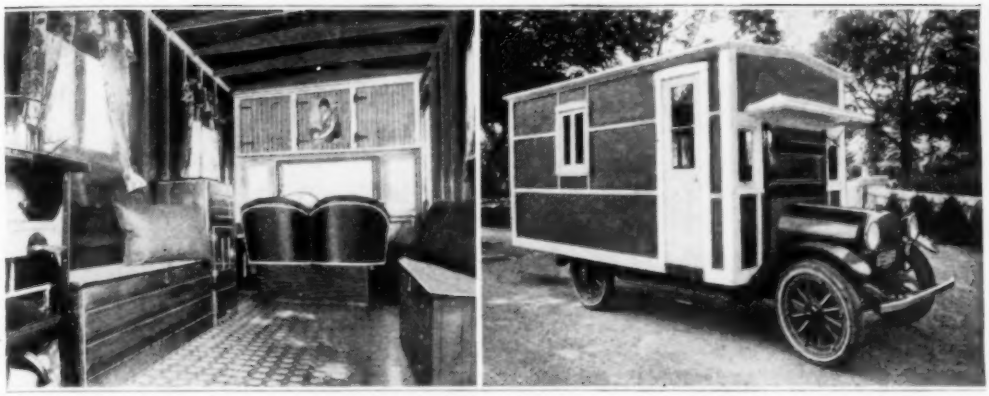
Tucked into the stern of a huge ore freighter, lately tied to a Philadelphia dock, is a deep water-ballast tank that was recently the scene of a near-tragedy. Lantern over his arm, the chief engineer had climbed down the ladder and set foot in the stale water covering the bottom. The mate, peering down from above, saw the "chief" totter and fall, and the lantern snuffed out by the water. Realizing at once the presence of poison gas, he shouted an alarm. Sailors and dock workers scurried vainly after gas masks; but two young assistant engineers, loyal to their chief, clambered immediately into the black pit—and were themselves overcome. Fortified by a stream of compressed air from the air hose, two more rescuers descended. As they struggled in the darkness they fell also, but not until the three engineers had been lifted to the deck.

WALLS OF OLD ADOBE CHURCH PROPPED BY BUTTRESSES

Destroyed in 1680 and rebuilt in 1710, San Miguel chapel in old Santa Fé, N. M., is one of the most ancient ecclesiastical structures in America. The infirmities of age are now creeping upon it, however, the disintegration of the adobe brick causing the walls to bulge. Church authorities are naturally unwilling to see harm come to the old structure, so have caused the erection of heavy stone buttresses to hold the walls in place, for a time at least. The modern concrete work contrasts decidedly with the old adobe construction.



Left, the Construction of Stone Reinforcements against the Chapel Wall; Right, a Completed Buttress



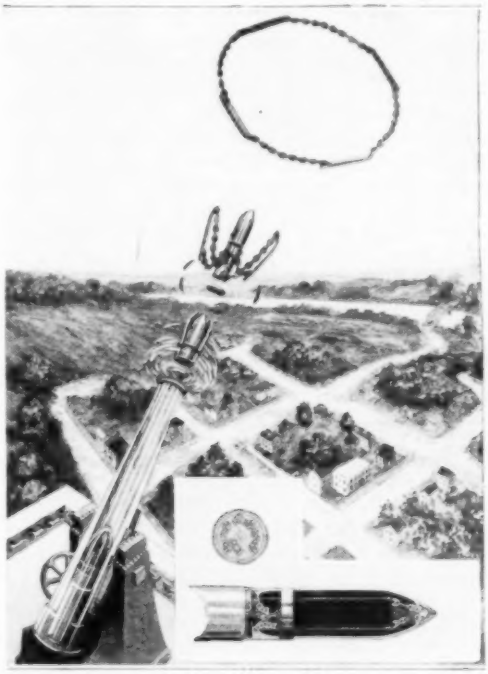
Fitted into This Modern Gypsy Van, with an Economy of Space Seldom Seen outside Shipboard, Are an Oil Cooking Range, a Folding Bed, a Refrigerator, Cupboards, Curtained Windows, and a Dozen Little Household Luxuries. The Comforts of This Snug Traveling Home are to be Enjoyed by a Husband and Wife Who will Tour the United States in an Effort to Recover the Husband's Health

COMFORTABLE HOME BUILT ON AUTOMOBILE CHASSIS

Gypsies have wandered through the countries of Europe for the last 500 years, but it has remained for an American shoemaker and his wife to do the thing in unprecedented style. Ordered to live in the open air after an attack of "flu," the shoemaker decided to tour the United States. By means of a publicity scheme, he secured the coöperation of the local chamber of commerce, hired a carpenter, bought an automobile chassis, and built his unusual home. It boasts only one room, it is true, but therein are concentrated comforts and conveniences sometimes lacking in a five-room apartment. It is lighted by electricity, heated by electric radiators, equipped with an oil cookstove, a refrigerator, a folding bed, a table, chairs, and a day couch.

ANTI-AIRCRAFT PROJECTILE EXPANDS TO LARGE AREA

Somewhat reminiscent of the old-time "chain shot," familiar to those who look at the pictures in the back of the dictionary, is a strictly modern form of anti-aircraft projectile designed by a Cincinnati automobile man. Of the conventional outside shape, the new projectile is split longitudinally into four parts, fastened together by long chains carried inside the casing. Rapidly rotated by the rifling of the gun, the novel missile flies apart by centrifugal force on leaving the muzzle, and becomes a huge ring, covering an area a hundred times the size of the gun caliber. An alternative arrangement is to release the fastenings by a time fuse, set for the range of the target. The design was inspired by the demonstrated ineffectiveness of ordinary projectiles against air craft.



Successive Positions Assumed by the Split Projectile After It Leaves the Gun: The Insert Gives Cross and Longitudinal Sections of the Missile

¶ The use of rushes for reinforcing concrete is said to be particularly valuable in the construction of thin-walled structures such as ships.

MECHANICAL HAND OPERATED BY MOVING SHOULDER

With many former fighting men minus arms, appliances for the remedy of such loss are receiving considerable attention,

Attachment for Artificial Arms: Tin Cups, Hats, and Other Objects can be Grasped and Lifted with the Curved Jaws. On the Right are Shown the Details of the Interesting Device

and numerous new devices of this kind are being placed on the market. Among these is a contrivance manufactured by a Canadian firm to serve as a hand. It consists of two hooklike jaws, held together by a spring, and designed to be opened by pulling a cable attached to a lever on one of the members. The hand is screwed to the end of an artificial arm, and the cable attached to a harness which passes over the opposite shoulder. A slight forward movement of the latter opens the jaws, and objects inserted between them are held firmly by the spring.

BIG CALIFORNIA MOVIE PLANT TO SERVE MANY PRODUCERS

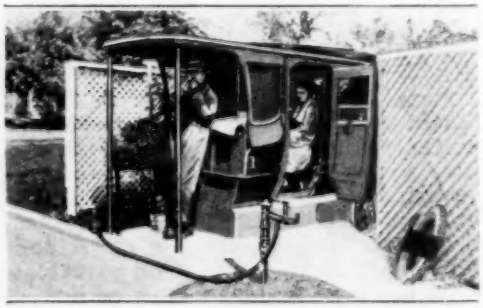
One of the southern California film-producing centers is to have a huge new studio and plant, designed to serve as many as 30 movie-making concerns at one time. The buildings will cover about half of a 40-acre field now used for flying, the total cost being estimated at $1,500,000. One stage will be 100 by 480 ft., divided into eight parts; two, 100 by 360 ft., will take six companies each, and two, 100 by 350 ft., will serve five more apiece. Factory floor space of 80,000 sq. ft., containing all necessary departments, will connect with the stages by a 30-ft. runway, 1,000 ft. long, with electric trucks to transport the materials. Each tenant company will have its own administration building.

SNOWBALLS FORMED BY WIND IN SOUTHERN MAINE

Eccentric nature romped in southern Maine last spring and strewed the country with some remarkable playthings, countless snowballs of varied size, formed without the aid of human hands. A heavy snowstorm was followed by sunshine and a high wind. The latter, coming in gusts, picked up small quantities of the partly melted snow and blew them across the fields. As the collections of flakes traveled, they became more or less ball-shaped and increased in size by gathering snow from their paths, and came to a stop only when their weight became too great for the wind to move. In one case a ball was rolled 36 ft. before it stopped. The diameters of the spheres ranged from 2 in. to 2 ft. Larger balls were formed on slopes, where the incline assisted the wind.

OLD LIMOUSINE BODY SERVES AS CASHIER'S OFFICE

Its passenger-carrying life over, an old limousine body is serving in a western city as an office for the cashier of an automobile filling station. A shelf has been built over the front seat, behind which the money handler sits, and on this is placed a cash register. The body is supported by a concrete foundation, and made more attractive by flower boxes and a latticework fence.



This Old Limousine Body Makes a Convenient Office for the Cashier of an Automobile Filling Station in a Western City

HARDWARE STOCK REPRODUCES STATE SEALS

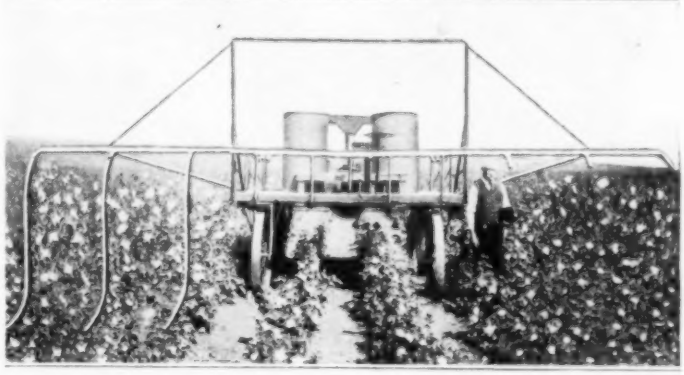
Reproductions of State Seals, Built Up of Standard Hardware Stock, of Which There Are 1,055 Pieces in the Alabama Seal, 829 for Florida, and 285 for Georgia: Hinges, Tools, Razors, Pocketknives and Scissors, Drawing Instruments, and Other Articles were Used

Hardware stock lends itself to the assembly of astonishing images, as the window displays of retail stores not infrequently testify. An ambitious effort of this kind was recently revealed in the construction of a number of state seals with standard material. That considerable labor was involved, not to mention unusual patience, is shown by the fact that the seal of Tennessee took 1,358 pieces; the Alabama seal required 1,055 pieces, and those of Florida and Georgia, 829 and 285 respectively. Taking the least of these as an example, the seal ring was made of fancy hinges, pliers, wrenches, aluminum letters, house numbers, and trade-marks. The columns consisted of scissors and pocketknives; the base, of manicure instruments; the cornice and arch, of razors and knives; the sun, of a protractor and sacking needles, and the soldier, of sand and emery papers and rubber packing.

It Required a Total of 1,358 Pieces of Hardware-Store Stock to Make the Seal of the State of Tennessee, Besides Much Patience and Labor

COTTON-HARVESTING MACHINE USES VACUUM SYSTEM

Economically important in the highest degree, and of special interest in the South, if practical, is a cotton-harvesting machine that recently passed preliminary tests satisfactorily. A vacuum system is employed, this comprising an air-suction pump, connected through two tanks to a long manifold on which several lengths of hose are attached. All the parts are mounted on a truck, which is propelled by the gasoline engine used for actuating the pump. Each hose terminates in a nozzle designed to admit cotton, but to exclude foreign material, such as leaves and sticks. Cotton is sucked out of the bolls and carried through the hose and manifold to the tanks, where it is dumped into sacks. When a sack is filled, it is replaced with an empty one. As many rows of cotton plants as there are hose



Cotton Harvester in Operation: Fiber is Removed from the Bolls by Suction, and Carried through a Hose and the Manifold to the Vacuum Tanks, Where It is Discharged into Sacks. The Machine can be Used for Spraying the Plants with Insecticides

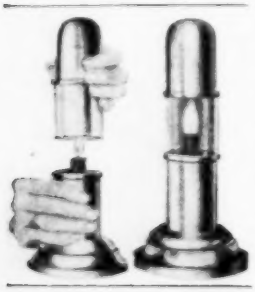
can be stripped of their fiber simultaneously. By disconnecting the manifold from the tanks and attaching it to the exhaust pipe of the pump, the harvester is converted into a blower for applying powdered insecticide.

LIGHTED SIGNS TAKE PLACE OF TRAFFIC POLICEMEN

Small towns on busy highways frequently have to cope with traffic as dense as that of big cities. For regulation after dark, a light on a post, nicknamed a "silent policeman," generally does duty at each crossing. A Kentucky village has improved this system by installing neat iron signposts on concrete bases in the middle of the crossings, a sign facing each street. Above the sign is a powerful electric light with a metal cap that serves as both a protection and a reflector, so that the nocturnal motorist has no excuse for not "keeping to the right."

CANDLE'S SENSITIVE FLAME IS VENTILATING GUIDE

As is well known, the supply of oxygen in a closed room may become inadequate for the needs of the human organism without the condition being realized. It is for this reason that an air-testing device has been developed by an inventor who has given considerable study to ventilating problems. To all purposes the contrivance is a warning signal that attracts attention to the need of replenishing the air supply in a room. Essentially it is a housed candle that burns with a low-temperature flame. The latter grows feeble or extinguishes itself when the surrounding air becomes deficient in oxygen content. So sensitively is the flame adjusted that it is noticeably affected when several persons enter, and remain for some time in, a closed room where it is burning. In a home or office an occasional brief test of the atmosphere is all that is necessary. It is claimed that if the candle burns with a bright, unfluctuating flame for three minutes, it indicates that the air is not vitiated. Should the flame be a feeble one, however, or extinguish itself, the room is shown to be in need of ventilation.



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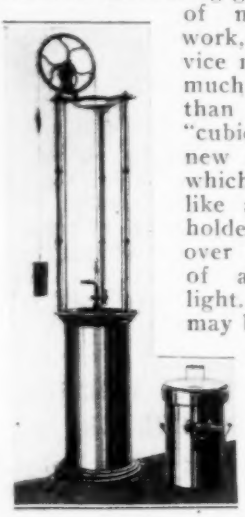
NEW GAS-MEASURING DEVICE FOR CALIBRATING METERS

A recent improvement in the apparatus used for measuring gas, in the calibration of meters and similar work, consists of a device not only simpler but much smaller and lighter than the old so-called "cubic-foot bottle." The new cubic-foot standard, which operates something like a miniature gas holder, is only 25 in. high over all, and when made of aluminum, is quite light. Either water or oil may be used as the sealing liquid, and the whole equipment, liquid and all, may be carried from place to place by one man—an impossibility with the old apparatus. The patented device is that at the right, and has been released to the public.



HARBOR DEVELOPMENT FOR TERMINUS OF SUEZ CANAL

The belief that Suez, southern terminus of the Suez Canal, will some day become one of the largest oil depots in the Orient seems borne out by the recent grant of several million dollars for a more commodious harbor. The old harbor was inadequate; the new will comprise a wide channel about a mile and a half long, protected by two great breakwaters extending into the Gulf of Suez. Within the breakwaters will be established a filling station to supply the constantly increasing number of oil-burning vessels.

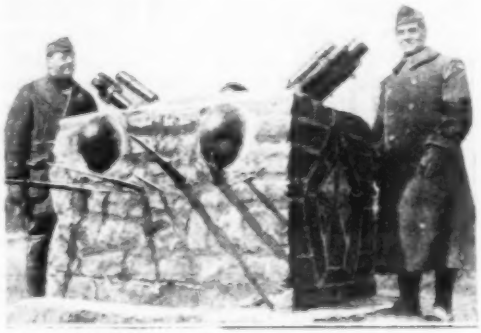
Future Officers and Crews of the United States Merchant Marine: These Men Are Students in One of the Schools Conducted by the Shipping Board, and Are Ready for a Practice Cruise on the Training Ship "Brookdale"

MERCHANT-MARINE STUDENTS MAN TRAINING SHIPS

Practical experience is one of the teachers employed by the Federal merchant-marine training schools to transform men without knowledge of boats and the sea into competent sailors. Students are placed on training ships, and learn their lessons while actually performing the duties of crews on these vessels. Twenty-five thousand recruits have been taught by this method since the establishment of the schools early in 1918. Classroom instruction, given on shore, supplements the practice cruises.

ARMISTICE-DAY BATTLE LINE MARKED BY CRUDE MONUMENT

A squat stone monument which rises four feet from the soil of France near Stenay will some day hold more interest for American tourists than the Arc de Triomphe, or a dozen others. For this was erected by engineers of the Fifth Army Corps, A. E. F., to mark the high water of America's triumphant advance against the embattled Germans, reached Nov. 11, 1918. There's not another monument like it in the world. Trench mortars and helmets deck the top, bristling bayonets and more helmets adorn the sides. On one side is the pentagonal insigne of the Fifth Corps, worked out in colored stone. The monument rests on an enduring base of concrete.



BY COURTESY OF CHESTER V. SHAFER

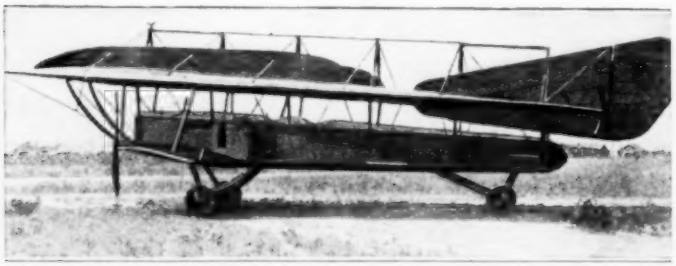
The Two Staff Officers are Standing Proudly by the Odd Monument That Marks the Battle Line of the Fifth Army Corps, A. E. F., on Armistice Day

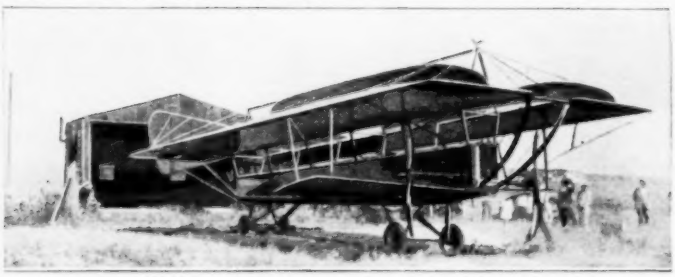
¶By dividing the box body of his motor truck into three sections, with removable partitions, a Nebraska merchant is saving considerable time and expense in delivery. Such commodities as coal, brick, and tile are so loaded that the last delivery is put in first, and the first last.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

AIRPLANE BUILT IN DEFIANCE OF CONVENTIONAL DESIGN

Aeronautical engineers will have to go to school all over again if success attends the trials of an odd airplane recently completed. Thus, while the wings of the conventional airplane extend from the fuselage at right angles, the main wings of this strange machine are built above and parallel with the fuselage. Huge longitudinal fins, propellers driven from within the fuselage, landing wheels at both rear and front, all serve to heighten the bizarre effect. The "ship" is reported unofficially to have been seen in flight above its hangar.





In Side and Three-Quarter View is Shown the Revolutionary Structure of the New Airplane. The Larger Wings Extend Longitudinally Rather Than Transversely

HARVARD FRESHMEN REQUIRED TO PLAY OUTDOOR GAMES

Vanished, at Harvard University, is the old attitude which divided the student body into two camps, composed of those who went in for development above the collar, and those who favored development below the collar. For it is now ruled that every freshman shall participate in some outdoor game for at least three hours each week. After examination by a school physician, the student is given a limited choice which will carry him to the baseball diamond, to the football gridiron, to the wrestling mat, or some other arena of endeavor.

WORLD-WIDE PICTURE SHOWS TO COMBAT IGNORANCE

Conditions of ignorance, which are so largely responsible for the spread of Bolshevism and the ravages of disease in all quarters of the world, are to be combated by the distribution and display of motion pictures on a tremendous scale. The bureau handling the plan, which has the cooperative support of our government and many others, already has accumulated a grand total of 21,000,000 ft. of film, all of an instructive or inspirational nature. Those who will exhibit these pictures free are able to borrow them without charge. One large commercial-film concern has placed its 76 exchanges, in all parts of the world, at the bureau's disposal, and the pictures will be shown in motor-truck theaters in regions difficult of access, as well as in the factories and halls of civilized industry, for the benefit of all classes of workers.

HANDLE AND FLAP FASTENER ON PAPER ENVELOPE

A self-sealing paper envelope which has a handle as an integral part was patented recently, and has made its appearance in retail stores, where it is used for small purchases. The handle is formed by the material surrounding a circular hole, large enough to admit a finger, at the flap fold, and a semicircular cut in the flap, about ⅜ in. from the edge of the hole. When the flap is folded over, the handle is available for use. A tab cut in the mouth of the envelope is shaped to serve as a lock when passed through the opening in the flap.

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HOT-MUD TORRENTS SMOTHER JAVANESE VILLAGES

PUSHING and tumbling out of this steaming crater, three rivers of boiling mud recently inundated the countryside about Mt. Kloet, one of 22 volcanoes on the island of Java. Following the horrible flood, which crawled over smiling plantations of coffee and rubber, over little villages, and even into the city of Blitar, came a devastating rain of cinders and stones. Two days later the eruption had quieted sufficiently to permit this exploring party to reach the side of the crater, where this photograph was taken. On its return the party reported that 7,000 bodies had already been counted among the chaos.

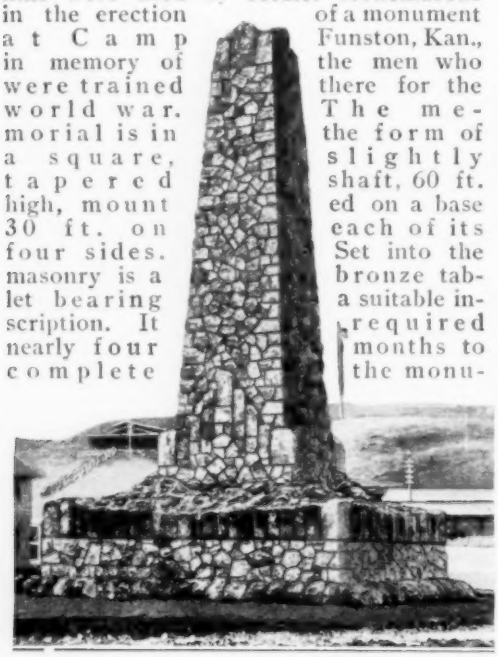
MARINE FORESTS BURN DOWN TO LAKE SURFACE

Workers on the Panama Canal whose duties carry them along the shores of Gatun Lake often report strange fires which sweep the inundated jungle. Igniting from some unknown source, possibly by spontaneous combustion, the dead trees and creepers will flare up, and as the flames are carried along the water by the wind, will become the center of a considerable blaze. As the trees are valueless, no one stirs to extinguish the flames which consume the vegetation down to the water's edge and leave protruding only the charred stumps to mark the former forest. The result is the very picture of desolation.

Only These Blackened Stumps Remain above the Surface after the Forest Fires Which Sometimes Burn on Gatun Lake. The White Trees in the Background were Not Touched by the Blaze

MONUMENT IN TRAINING CAMP ERECTED BY SOLDIERS

Rough stones gathered from near-by hills were used by soldier stonemasons in the erection of a monument at Camp Funston, Kan., in memory of the men who were trained there for the world war. The memorial is in the form of a square, slightly tapered shaft, 60 ft. high, mounted on a base 30 ft. on each of its four sides. Set into the masonry is a bronze tablet bearing a suitable inscription. It required nearly four months to complete the monument, which was dedicated by the commanding officer of the camp.



The Stones Used in This Monument, at Camp Funston, Kansas, were Gathered from Near-By Hills and Put in Place by Soldiers

QUEER STUDY IN PHYSIOGNOMY RESULT OF TWO NEGATIVES

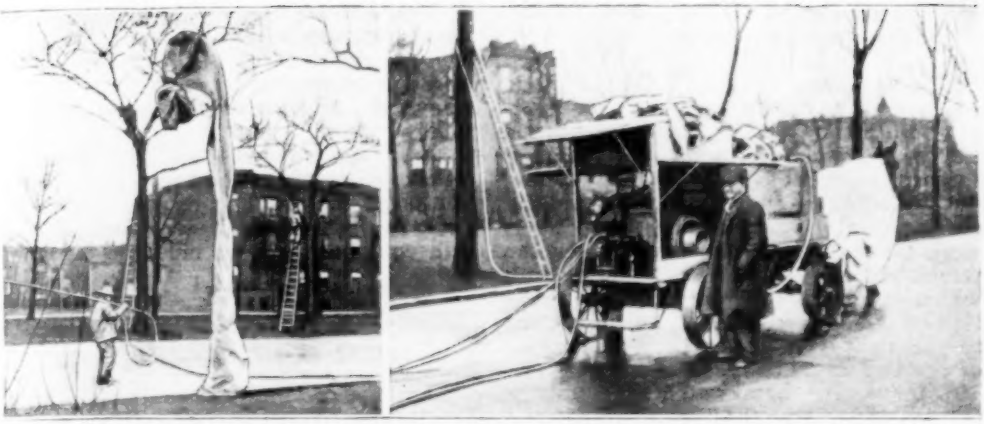
Freak photographs of every conceivable sort have gone the rounds; but a New Jersey amateur the other day produced an effect that revives the flagging interest. Attempting a portrait with half the subject's face in shadow, he compromised a poor situation by making two exposures, hoping one might prove usable. By reversing one negative on the other, he printed a passable likeness. When one of the plates became slightly twisted on its axis, however, the result was a "phiz" startlingly brutal and predatory; and twisting it the other way developed a set of features of quite the opposite type, thus revealing an unsuspected mechanical factor in facial composition.

NEW YORK-TORONTO AIR RACE TRIUMPH FOR LIBERTY PLANE

The biggest and most spectacular competition in the history of aviation was the New York-Toronto round-trip handicap. Twenty-eight of the American, Canadian, English, French, Italian, and German airplanes entered were able to complete the round trip of 1,042 miles despite blinding storms that taxed engines to the utmost and even ripped fabric from many wings. The obligatory stops at Albany, Syracuse, and Buffalo furnished welcome breathing spells for tired pilots and observers.

Unfortunately the rules of the race were quite unusual, causing much misunderstanding among the uninformed. Thus, while Major Schroeder, in a Vought machine, was "efficiency" winner because his biplane performed most nearly according to specification, eight other entrants flew the circuit in faster time. Army regulations, which prohibit service fliers from accepting cash rewards, further complicated the result, causing the efficiency prize of $10,000 to go to a civilian who finished twenty-second in a Curtiss biplane. When they study the flying time consumed by the various contestants, however, army authorities are proud to find that seven of the ten planes finishing the course in fastest time were American "DH-4's," powered by the distinctively American Liberty engine.

A Study in Physiognomy: First Picture, Made from Two Negatives, One Reversed; Second, Left Negative Twisted to the Left; Third, Left Negative Twisted to the Right; Fourth, Left Negative Shifted to Show How Pictures were Composed



At the Left Is an Ornamental Lamp-Post, Completely Covered by the Spray Protector Used While Spraying Park Trees. The Spraying Machine is Seen at the Right, with Its Gasoline Engine and Pump Just Visible inside the Wagon

USE ENGINE AND COMPRESSOR FOR SPRAYING PARK TREES

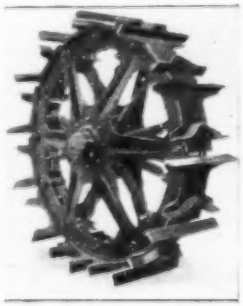
A rather elaborate equipment is used by one of Chicago's park boards for spraying the shade trees of the boulevards and parks, as a protection against insects. In the spraying wagon is an air compressor driven by a gasoline engine, and a constant pressure is automatically maintained in the tank containing the liquid. The air pressure is applied in such a way that the spray is atomized, and its extremely fine particles penetrate to all parts of the foliage without waste. Because of the corrosive effect of the liquid used, it is necessary to cover all lamp-posts within range of the spray, and wrappings for them are carried on the wagon. The wheels are shod with broad steel tires to avoid injury to the pavement.

HYDROELECTRIC POWER PLANT AT VICTORIA FALLS

The world's greatest cataract soon will be generating electrical energy, according to a recent, supposedly authoritative, announcement, which declares that work on the long-deferred project for erecting a hydroelectric power plant at Victoria Falls, on the Zambezi River, South Africa, will begin in the near future. The scheme has been under consideration since 13 years ago, when a company formed for that purpose was granted permission to build a plant capable of producing 250,000 hp. at the falls. For various reasons construction was postponed. Chief among these was the abundance of cheap coal. Now that mining costs are increasing, interest has been revived in the plan for harnessing the falls. Current probably will be used by the famous Rand gold mines, located some 600 miles from the site of the proposed plant. It is estimated that at least 20 per cent of the power generated at the falls will be lost during transmission this distance. A survey of the falls has been made.

TRACTOR WHEEL'S IRON PADS PREVENT ROAD DAMAGE

A tractor wheel designed to give maximum traction with minimum road damage, first built by Italian engineers, has now been introduced to the American market. Essentially the traction element consists of a number, usually 12, of flat steel pads, held against the wheel rim by individual coil springs hung from the hub. Each of the pads is fitted with a wedge-shaped flange which enters the rim between rollers, so that there is a roller in each space between adjacent pads. The rollers transmit the driving power to the pads, which are free to follow the inequalities of the road surface as they rock back and forth on the arc of the wheel periphery. Tractors so equipped have hauled as much as 80 tons without road damage.



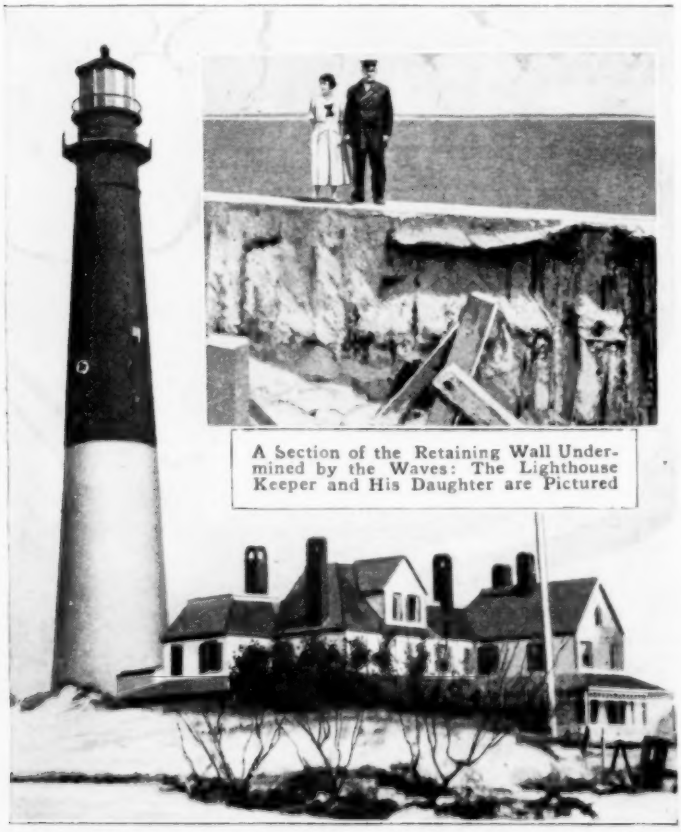
Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

JETTIES PROTECT OLD LIGHTHOUSE FROM THE SEA

Fortifications to protect the famous old Barnegat lighthouse on the New Jersey coast from the onslaughts of the sea are being constructed in the form of jetties, expected to prevent the washing away of the sand on which the lofty structure stands. Eleventh-hour steps were taken to save the tower after the waves had undermined the retaining wall which surrounds the government reservation on which it is located, and threatened to eat their way under the foundations of the building.

A temporary breakwater of sandbags was built, awaiting the arrival of material for the jetties. One of the latter will extend 200 ft. into the water from one angle of the retaining wall, while another, 75 ft. long, will parallel the first, extending from another angle. Concrete blocks will be used, with a mattress of brush between each course. The piers will be 4 ft. across at the top, 22 ft. through at the base, and will stand 4 ft. above the surface of the water at high tide.

First erected in 1838, the Barnegat lighthouse is one of the best-known signal shafts on the Atlantic coast. It was rebuilt in 1858 in its present form, but is still equipped with an old-style oil lamp.



A Section of the Retaining Wall Undermined by the Waves: The Lighthouse Keeper and His Daughter are Pictured

Barnegat Lighthouse: Concrete Jetties are being Constructed to Shield the Great Tower from the Sea, Which is Threatening to Sweep the Sand from under Its Foundation. The Keeper's Residence is Shown beside the Lofty Beacon. An Oil-Burning Lamp Provides Light

IMPROVE VALPARAISO HARBOR WITH CONCRETE WORKS

Shortage of labor and materials during the war so impeded the contractors engaged in adding extensive improvements to the harbor at Valparaiso, Chile, that three more years will be required to finish the work, though the original plans provided for its completion before 1920. In spite of the difficulties encountered, much has been accomplished and the facilities of the port already have been greatly increased.

Concrete is being used for practically everything connected with the project. This includes a breakwater, 943 ft. long; a quay wall, 2,066 ft. long; a mooring jetty, 820 ft. long and 328 ft. wide; a wharf for coal and other materials, 656 ft. long and 98 ft. wide, and many other large structures.

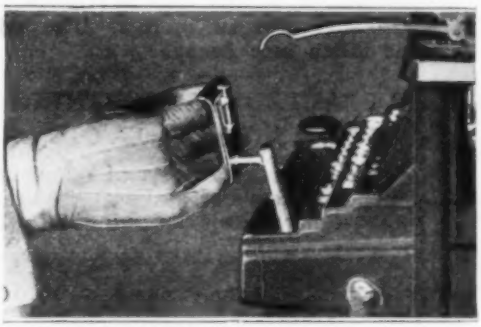
A novel method was used in constructing the deep-water portion of the enormous breakwater. Sand and quarry rubbish were used to build a mound to within about 16 ft. of the surface of the water. Reinforced-concrete boxes, 65 ft. long, 20 ft. wide, and 40 ft. deep, were floated over this foundation and sunk, after which they were filled with concrete. Unfilled, the boxes weighed 2,500 tons, and when filled, about 9,000 tons. They were built in a large tempo-

rary dry dock of sheet steel and concrete. A similar method was employed in constructing the jetty.

Proof that the various structures will withstand the action of the waves was obtained during a recent storm, which, though extremely violent and disastrous to shipping, did no damage to the works then completed.

BLIND AND ARMLESS SOLDIER OPERATES TYPEWRITER

Physically wrecked by their experiences on the battle field, many veterans of the world war have been supplied with substitutes for lost limbs, and trained to employ them with marvelous dexterity. A British soldier who was deprived of his arms and eyesight by the explosion of a defective bomb is an example. Aided by artificial arms and hands, and a simple attachment for one of the latter, he operates a special typewriter with remarkable speed and accuracy. The attachment consists of a rubber-tipped metal bar, bracketed to an adjustable band which is used to fasten the device to an artificial hand. Large square keys distinguish the typewriter from an ordinary writing machine. The handicapped learned his new accomplishment in an army hospital.



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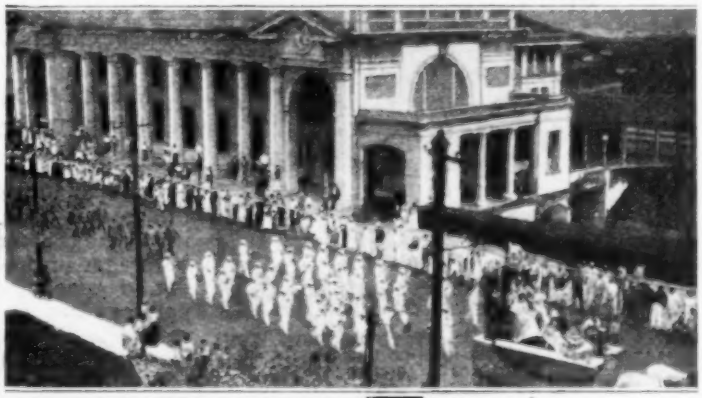
Device with Which an Armless Blind Soldier Operates a Typewriter: The Machine is Equipped with Large Square Keys

¶ Plans are being made for harnessing the Paraná River, a large South American stream. A survey of Iguassu Falls is being made by the government of Argentina, with the idea of building a hydro-electric power plant at that point.

OLDEST NEW WORLD CITY CELEBRATES FOUNDING

Four centuries ago the city of Panama came into existence as the first settlement of Europeans on the western hemisphere, then known as the New World, and recently its present-day citizens celebrated the four-hundredth anniversary of its founding with appropriate ceremonies. Addresses were delivered in the old city, five miles from the present municipality, and parades were held in the new city. The history of Panama includes interesting events, chief



Parade Passing the New Railroad Station in the Modern City of Panama during the Four-Hundredth Anniversary Celebration Held a Short Time Ago

Cathedral Ruins in the Ancient City of Panama: In the Vicinity of This Historic Building the First European Settlement in the New World was Founded Soon after the Discovery of America

among them being the construction of the great canal of the same name and the destruction of the city by the buccaneer, Henry Morgan, in 1671. The old city has fallen into decay.

FIRE STARTED BY LIGHTNING DESTROYS TANK OF OIL

Fifty-five thousand barrels of oil went up in dense clouds of smoke at Dawes, W. Va., recently, after lightning struck

Blazing Oil in a Large Steel Tank, at Dawes, West Virginia: The Conflagration was Started by a Bolt of Lightning

a large steel oil tank, setting fire to its highly inflammable contents, which burned fiercely for 24 hours before they were entirely consumed. It is estimated that the loss was nearly $300,000. The costly and spectacular conflagration was viewed at close range by many.

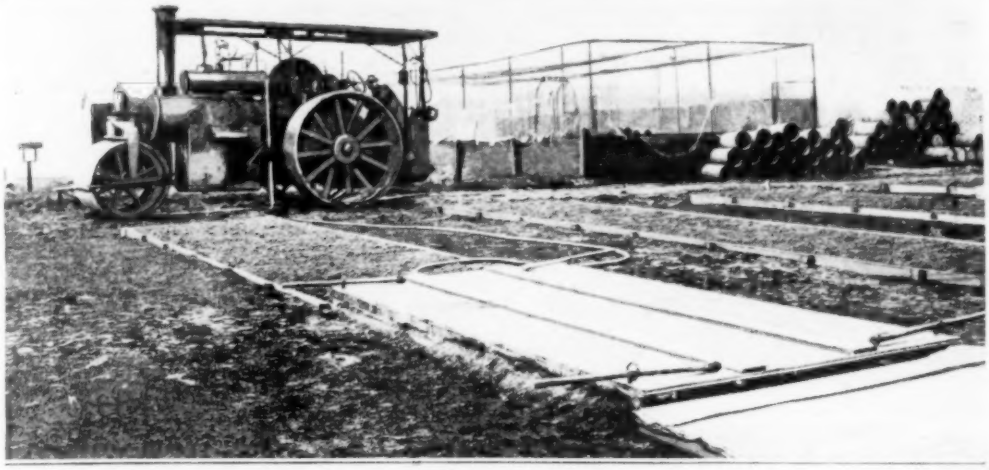
¶ Postage stamps recently issued by Uruguay bear portraits of President Wilson, President Poincairé, and the rulers of other countries which fought against Germany in the world war, including England, Italy, and Belgium.

AMERICA'S MERCHANT MARINE QUADRUPLED DURING WAR

War's effect on the merchant marine of the United States is told graphically in statistics revealed in the latest edition of "Lloyd's Register of Shipping," the first uncensored issue since the beginning of the war. A comparison of the amount of seagoing steam tonnage flying the flags of various countries before hostilities began and at the present time shows that, in 1914, American steamers had a total gross tonnage of 2,027,000, while the figure for 1919 is 9,773,000 gross tons. This means that the United States now owns more than four times the amount of tonnage in its possession before war began, an increase of 7,746,000 tons, or 382 per cent, in five years. This country now takes second place, formerly held by Germany, in steamship tonnage, the United Kingdom leading with 16,345,000 gross tons, in spite of a war loss of 2,547,000 tons. Japan has added 617,000 gross tons, or over 36 per cent, to its merchant marine, and the fleets of France, Holland, and the British dominions also show some increase, but the fact that the world's shipping came out of the war with a gain of 2,493,000 gross tons since 1914 is obviously and entirely due to the unprecedented shipbuilding activities of this country.

SWEET POTATOES AND MALT PRODUCE GOOD SIRUP

An extremely simple process produces a good grade of sirup from sweet potatoes and malt, the latter an important item in the manufacture of alcoholic beverages in pre-prohibition days, according to government chemists. The sweet potatoes are boiled until soft and then mashed. When the temperature of this mass is 140° F., a quantity of ground malt, equal to 3½ per cent of the weight of the uncooked potatoes, is added, and the mixture is allowed to stand for a few minutes. Heat is then applied, and the substance is stirred constantly until it reaches a temperature of 150° F., when it is removed from the fire and allowed to stand for an hour. During this time it is stirred occasionally. Juice is extracted from the pulp by placing it in cloth bags and applying pressure. By boiling this juice, sirup is obtained. No special apparatus is necessary for the production of the sirup, ordinary kitchen utensils being suitable. Its cost is extremely low.



Sterilizing a Tobacco-Plant Bed with a Steam Road Roller: In the Foreground Is One of the Beds, Tightly Covered. The Machine Cooks the Soil with Steam Carried to the Bed through a Hose

UTILIZE STEAM ROAD ROLLER TO STERILIZE SOIL

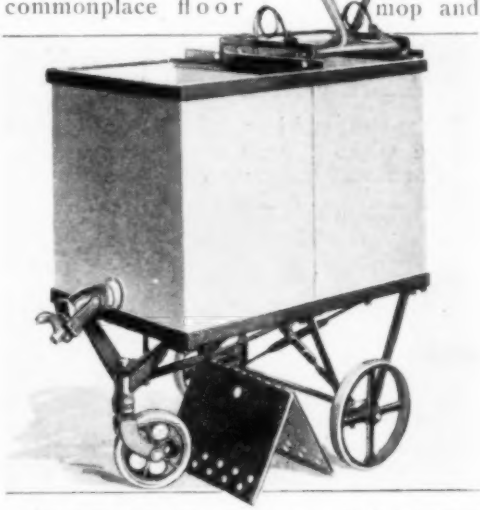
Great care must be exercised by tobacco-plant growers in the preparation of beds for producing the sets. The destruction of weed seeds and insect larvæ is highly important, as the plants are easily handicapped during their early stages of development. It has been a common custom to build fires on the beds for this purpose. Recently steam has been used. An eastern grower uses a steam road roller, transferring hot vapor from the boiler of the machine to the beds with a hose. Tight covers are placed over the beds while the sterilization is in progress, and a temperature of 212° F. is maintained for two hours.

WILD FOWL DIE FROM DIET OF STRAY SHOT

Thousands of wild ducks and other waterfowl die each year from lead poisoning, incurred by eating stray shot picked out of the mud about popular shooting grounds. Many ducks recover from the malady, it is true, but even these are permanently injured. Females mated with affected males lay many infertile eggs, mingled with others which produce puny young. The affection is, of course, a result of the fowls' habit of swallowing small, hard objects to furnish grit for the gizzard. Here the little lead pellets are ground away, to pass into the intestines, where they produce progressive paralysis and, usually, death.

FLOOR-MOPPING CONVENIENCE IS TANK ON WHEELS

New labor-saving devices appear on the market almost daily, and but few lines of work have escaped the attention of inventors. At last the commonplace floor mop and its wielder have been noticed, with the result that another convenience is now for sale. It is a metal tank for suds, mounted on three rubber-tired wheels, and equipped with a wringer, a receptacle for soap or washing powder, and a drain valve. Being painted in white and black, the truck is far from unsightly.

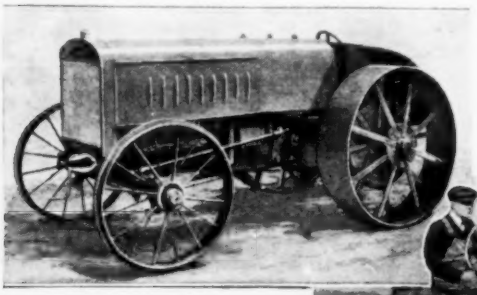


Wheeled Tank for Floor Mopping: It is Equipped with a Wringer, a Compartment for Soap or Washing Powder, and a Drain Valve

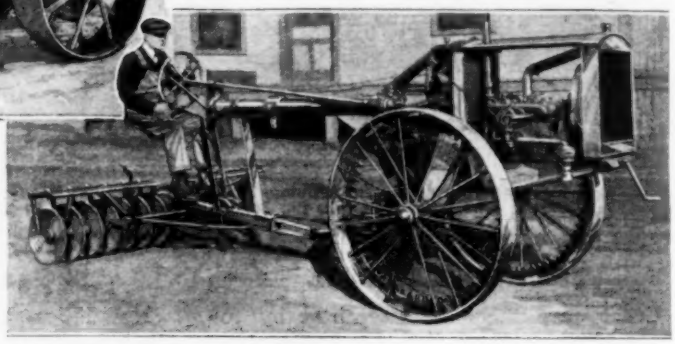
Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

SIMPLE TWO-WHEEL TRACTOR REPLACES FOUR-HORSE TEAM

A tractor that can be relied upon to do the work of a good four-horse team, useful from planting time through all the operations of disking, harrowing, cultivating, and harvesting, fits most conveniently into general farm work. For such a machine a large Wisconsin manufacturer has adopted the two-wheel model. Driven by a 6 to 12-hp., four-cylinder engine, the machine develops a drawbar pull of 1,000 lb., and, when used with a 16-in. plow, can handle a small disk and smoothing harrow, or similar attachment, at the same time. A heavier model, designed to pull three or four plows, has an 18 to 30-hp. engine and four wheels. It has 50-in. drivewheels with 12-in. face, and travels at two speeds, 2.3 and 2.8 miles an hour, with one speed reverse. It exerts 3,000 to 4,000 lb. of drawbar pull.



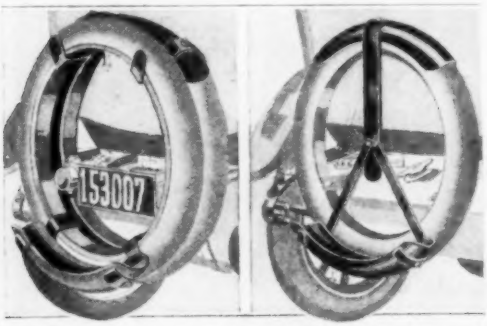
Heavier Four-Wheel Tractor of the Same General Type as the Light Model at the Right, Giving 3,000 to 4,000-Pound Drawbar Pull



Two-Wheel Tractor That Takes the Place of a Four-Horse Team for General Farm Work, and Is Useful from Planting to Harvesting. It Develops Up to 12 Horsepower and a 1,000-Pound Drawbar Pull

NEW SPARE-TIRE CARRIERS ATTACH WITHOUT TOOLS

Spare-tire carriers which can be attached without tools are a lately introduced automobile accessory. One consists of two metal forms, shaped to fit over the tread of a casing, that are joined by strips of metal. When one of the forms is placed on top of the extra tire carried in the regular iron at the rear of a car, the other becomes a cradle for an additional tire. Another device includes two tire-fitting forms, to each one of which are bolted two hooks. In applying this carrier, one of the forms is placed on top of the already attached spare tire, with the hooks protruding, and the other is hung below it by means of the hooks.



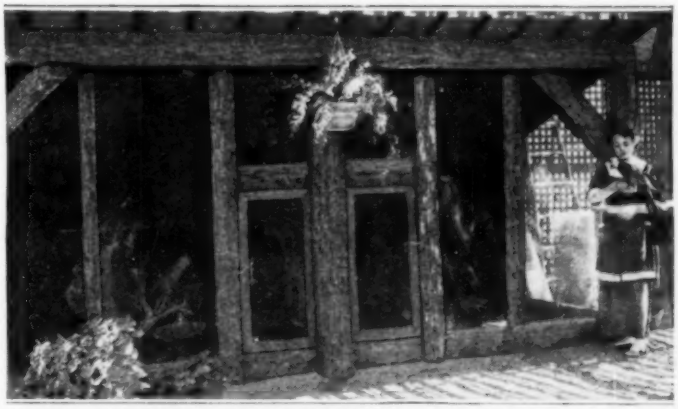
Two Forms of Tire Carrier for Extra Spare Tires: In Both, the Spare Already Attached Supports the Carrier for the Extras

NEW FOODS BEING EVOLVED BY AMERICAN CHEMISTS

The menu card prepared by science is constantly growing longer, and the next generation no doubt will discuss delicacies wholly unknown to the present. Among the curious things that American chemists are now experimenting with are edible oils from such sources as tomato seeds and cocklebur. A new product that promises great usefulness is an ice-creamlike paste prepared by condensing buttermilk. Bread made with this substance browns beautifully at low heat because of the sugar of milk it contains, which also gives it a pleasing flavor and a substantial quality. Beans and peas that have sprouted, as well as grains in the same condition, are found to make excellent food—a fact long known to the Chinese, who use them, flavored with meat, to make stews.

THE PARROT AND COCKATOO INDUSTRY OF CALIFORNIA

By JOHN EDWIN HOGG



The "Jungle" Cage in the Parrot Brooders Is an Imitation of a Bit of Tropical Wilderness, Whose Temperature is Maintained at 110 and the Humidity Kept High by Sprays of Water on the Sand Floor

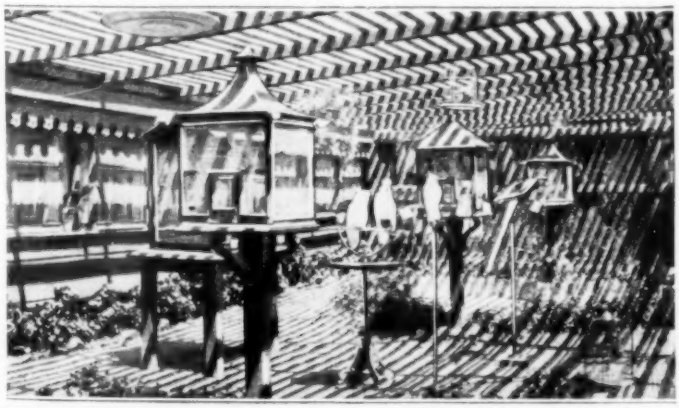
BEFORE the war, the United States imported parrots and other birds of the family to the value of approximately $1,000,000 each year. Most of the cockatoos came from Australia, while parrots and parrakeets were brought by thousands from Africa, Mexico, South and Central America, and also from the Isle of Pines, near Cuba. A few were shipped from Borneo and Java. Naturally the war shortage of shipping terminated these shipments, and old birds with vocabularies of from 75 to 100 words became almost priceless. Few were to be had at any price.

Baby Sulphur-Crested Cockatoo, Asserted to be the First One Successfully Hatched and Raised in America

About the time the scarcity of feathered talkers reached its height, some one recalled that parrots in captivity had been known to lay an occasional egg. The dealers began to open their eyes. Then they proceeded to develop a brand-new American industry, which bids fair to do away with the importation of birds of the parrot family, by raising them in captivity, like ostriches, or barnyard stock.

About the only requirement for raising parrots and cockatoos in certain sections of the United States is to know something of their habits and to create artificially conditions similar to their native environment. An abundance of fresh fruit is essential as well as a climate with high temperatures and with shade. Southern California offers more nearly these conditions than any other portion of the United States, except for its hot days and cold nights. Accordingly the parrot brooders are sun-heated in the daytime, and electrically heated at night.

The first attempts to produce a domestic supply of parrots and cockatoos were made with incubators. This was unsuccessful. The eggs hatched, but the baby birds perished for lack of mother's care in feeding them, all young birds of the parrot family being fed from the parent bird's crop, like doves or pigeons. Efforts were made to feed the incubator-hatched birds by hand, but to raise a single parrot by this method almost required the services of a special nurse. Setting parrots and cockatoos were then tried, and with greater success. The nesting room is virtually an artificial jungle in which the temperature is kept at 110° F. Humidity is maintained by numerous tiny spray pipes that



Parrots and Cockatoos Hatched in the "Jungle" Cage are Transferred Later to the "Acclimatization" Cages, and in from Three to Six Weeks the Feathered Pets become Accustomed to the Temperate Zone

Baby Parrots Learning to Climb Trees and Bushes, in a Special Cage Room to Which They are Transferred from the Brooders

discharge onto the sand floor upon which the birds make their nests.

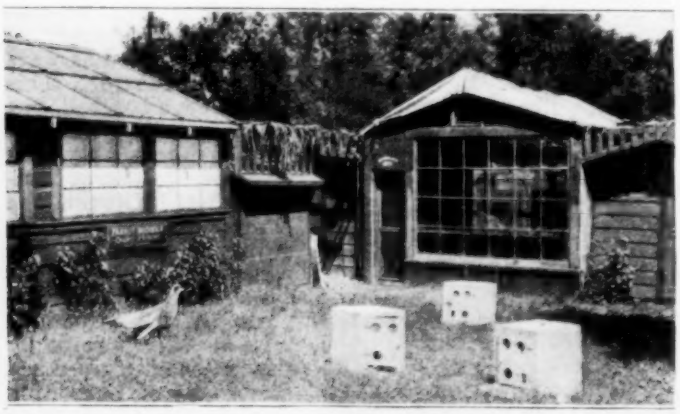
Obviously birds reared under such conditions cannot be transferred to a cage and shipped to a purchaser without dying or at least suffering serious injury to their health. Accordingly they are moved to the acclimating room. This is another greenhouselike structure, and there the temperature is gradually reduced. In from three to six weeks the little feathered pets become accustomed to climatic conditions similar to those of the average family piazza. They are then ready for shipment.

Several aviaries are now in operation where all the well-known varieties of talking parrots are being domestically reared, large macaws, cockatoos, and parrakeets.

As with everything else, the market-price of parrots is dependent upon quality. Their value increases with their vocabulary, and their ability to whistle and do tricks. Similarly a parrot that speaks Spanish or French commands a higher price from a prospective purchaser of either nationality. The bird producers have not been slow in recognizing this, so in connection with nearly every aviary there is a school with a competent trainer. Here parrots and cockatoos are taught to talk, sing, and whistle and go through all manner of antics to increase their value.

Cockatoo's Nest, a Shallow Pit in the Sand, Lined with Sticks, and Located under the Thickest Foliage That can be Found

Considering the progress made in less than two years, most of the aviarists are of the opinion that very soon the nation's entire supply of such birds will be domestically produced, and importation will be eliminated.



Though Electrically Heated at Night, the Sun Warms the Parrot Brooders during the Day, and to That End They are Built Like Greenhouses. The Square Boxes on the Lawn Are Feeding Cages for the Young Birds

MEDICAL-CORPS HISTORY IN PHOTOGRAPHS

Thanks to the skill and daring of the army photographer, the Medical Corps of the United States Army will not soon forget the grim lessons learned in the recent war. Approximately 10,000 still pictures and more than 14 miles of motion-picture film have been collected and systematically filed as a pictorial record of all Medical Corps activity overseas. Some photographs depict actual battle conditions. The field, evacuation, and base-hospital scenes are instructive.

and at a considerable saving over the expense of importing the same birds even if such importations had been possible. Not only have these aviaries succeeded in producing parrots, but they have been equally successful in the raising of the

LATEST STYLE OF PENMANSHIP REVIVAL OF ANCIENT ART

In the interest of legibility, practically lost sight of in the handwriting of the times, a style of penmanship new at least to this generation is being introduced in the schools of Great Britain, and promises to invade America. It is virtually a reproduction of the "print-writing" common in the 15th century. Its characters, formed with a stub or letterers' pen, are almost typelike in form, except that they are made at a slight angle and with no attempt at ornament. The main line of each letter is made heavy, and the letters are formed close together, but without connecting lines. Observers state that the school children are taking kindly to the easy and positive style of the new writing, and that it seems destined to succeed all the inefficient systems now employed.

WAR RECORD OF FRATERNITY PRESERVED ON HELMET

Instead of the conventional service flag, the members of a college fraternity use a captured German helmet, properly embellished, as a memorial to the men of the organization who served in the armed forces of the country during the war. The emblem of the order, fashioned in gold, is fastened at the center of the crown of the steel hat. Surrounding this are the names of three members who died in service, engraved on raised gold scrolls, while on the sides of the crown are carved the names of living ex-service men.

MOTOR-TRUCK ATTACHMENT FOR MAKING ROADS

Motor trucks can be converted into road-making machines at little expense by a recently patented attachment, designed especially for the lighter types of gasoline-driven vehicles. A scraper is suspended underneath a truck, when the device is used, on a frame which is connected with levers pivoted on a standard mounted on the floor above. By moving the levers, the scraper is adjusted to several positions for grading and leveling, or raised to clear the ground. Two men are required to operate the machine, one for driving and the other for manipulating the levers.

A Light Automobile Made into a Road-Making Machine: The Change was Brought About by Converting the Car into a Truck; Then Attaching a Device with Suspended Scraper and Levers for Adjusting It

ICELAND, LAND OF WONDERS, BEARS MISLEADING NAME

Even among well-informed people, the impression prevails that Iceland is a bleak, sterile, and forbidding land—a conception for which the name, doubtless, is wholly responsible. Attention focused on the big north-Atlantic island by its recent acquisition of full sovereignty has succeeded in partly dispelling its undeserved reputation. Its scenic charm is extraordinary, presenting all the wonders of glaciers and geysers, volcanoes and waterfalls, salmon rivers and mineral springs, on an unusual scale. Its history demonstrates the success of its parliamentary form of government, and reveals a remarkable literature that flourished in the 12th and 13th centuries, and still holds its influence over a population of 85,000.

INFLATABLE SWIMMING SUIT DOES NOT HAMPER WEARER

Common faults of pneumatic floating devices for swimmers, such as bulkiness, clumsy appearance, and interference with

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Pneumatic Bathing Suit: How the Blouse is Inflated is Shown at the Left. The Garment does Not Hamper the Movements of a Swimmer

the movements of the arms and legs, are declared to be absent from a new inflatable bathing suit, though the garment is capable of supporting its wearer in the water indefinitely. The upper portion, or blouse, of the suit is made of two thicknesses of rubber-impregnated cloth, the edges of which are fastened together to form an air-tight bag. A tube in the front of the blouse permits inflation after the suit is donned. In style, the costume is similar to ordinary bathing suits.

HOW ITALIANS SUNK AUSTRIAN SHIPS FINALLY DISCLOSED

The remarkable mechanism by which two Italian officers, with a courage still more remarkable, sunk the Austrian flagship "Viribus Unitis" and the liner "Wien" in the harbor of Pola has finally been disclosed. Major Rosetti of the Italian navy had constructed a floating torpedo of the usual shape, the head of which was composed of two detachable mines filled with about 350 lb. of "TNT" apiece. These mines could be attached to a ship's skin at any desired depth, and were exploded by clockwork. A small compressed-air engine in the rear drove the torpedo for several hours at slow speed, and it was steered by the hands of the operators, who lay astride of it.

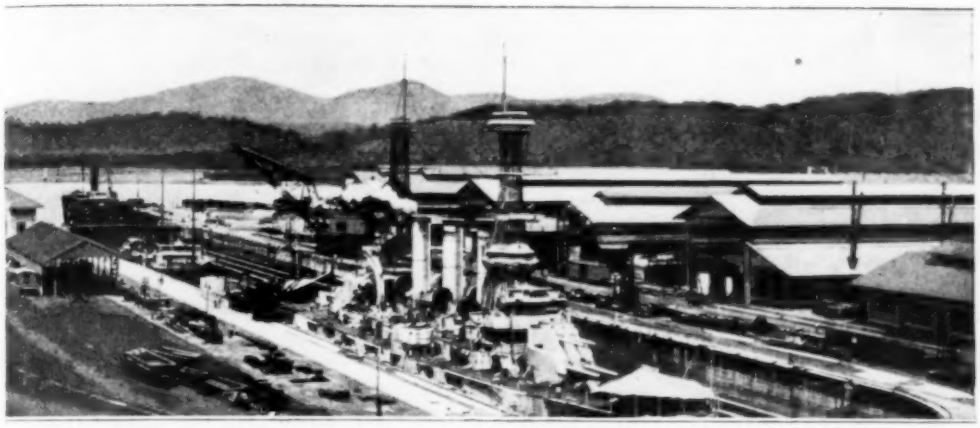
The naval officer was joined by Surgeon Sub-Lieutenant Paolucci, who had intended to swim into the harbor with a mine. For four months the men practiced passing all manner of obstacles with the torpedo. They discovered that injections of camphor greatly increased their ability to resist the cold water, and clothed themselves in light water-tight garments which exposed only their faces. At 10 o'clock in the night of Oct. 31, 1918, they started on their heroic mission. By 3 a. m. they had passed the external barrage, the harbor gate, and two inner barricades, paddling much of the way, against the tide, to avoid the sentry's eye. At about 5:00, Rosetti swam some 120 feet to the battleship, set the mine for 6:30, and returned. But it was now getting light; reveille sounded, and the men were discovered. Hastily setting the second mine, they started, submerging the torpedo. While the Austrians were discussing the most suitable fate for the prisoners, the flagship blew up and sank, followed by the big liner. A few days later the Italian navy entered Pola.

MISSPELLED SIGN INCREASES TRADE OF FRENCH CAFÉ

Bidding for the trade of English-speaking visitors in the city, the proprietor of a café in Le Havre, France, took some startling liberties with the language of his prospective patrons when he placed a sign over his windows not long ago. In spite of the fact that the legend reads "Legue Off Nations," it was understood, and many friends of the league-of-nations plan became his customers.

A Frenchman's Spelling of League of Nations: In Spite of the Mistakes, This Sign Attracted English-Speaking Patrons to a Café in Le Havre, France

NO SHIPS TOO LARGE FOR PANAMA CANAL SHOPS



View of the Balboa Dry Dock, Looking West: In It Are a Steamer, a Tugboat, and the United States Ship "Rhode Island." The United States Transport "Von Steubob," Damaged at Sea Just Prior to the Halifax Disaster, was Routed to the Balboa Dry Dock for Needed Repairs, Which were Completed in Record-Breaking Time

So tremendous and so active an engineering enterprise as the Panama Canal must necessarily have a great workshop. The big shops which handle the repair work of the canal are situated at Balboa, on the Pacific end, and are peculiar in that, while strictly government properties, they are prepared to execute any private steamship or railroad repair work that may be required. The mammoth dry dock is over 1,000 ft. long, 113 ft. wide at the floor, and 143 ft. at the coping, with a depth at mean low water of 29.3 ft., enabling it to handle with ease the largest ships afloat. The dock is of concrete on solid rock, the gates being practically the same as those of the canal locks.

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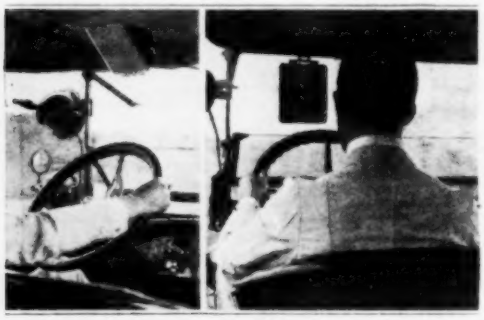
The Mammoth Size of the New Balboa Dry Dock, Which Is Over 1,000 Feet Long, may be Better Realized from This Bird's-Eye View, in Which is Seen a Seagoing Vessel of Ordinary Size Undergoing Repairs. The Big Workshops of the Panama Canal are Seen at the Right of the Dry Dock. The Whole Plant Is Able to Handle the Largest Ship Afloat

EYES OF AUTOMOBILE DRIVER PROTECTED BY SHIELD

Similar in principle to many other devices intended to prevent the temporary blinding of automobile drivers by the headlights of approaching cars, a contrivance recently invented by an eastern dentist is declared to be as effective as it is simple. A small sheet of metal is hinged to a clip that fastens to the top edge of an ordinary windshield in front of the driver's seat. Lowered, the plate shields the eyes of the driver from glare, but does not interfere with a view of the road. It can be folded up for daytime driving.

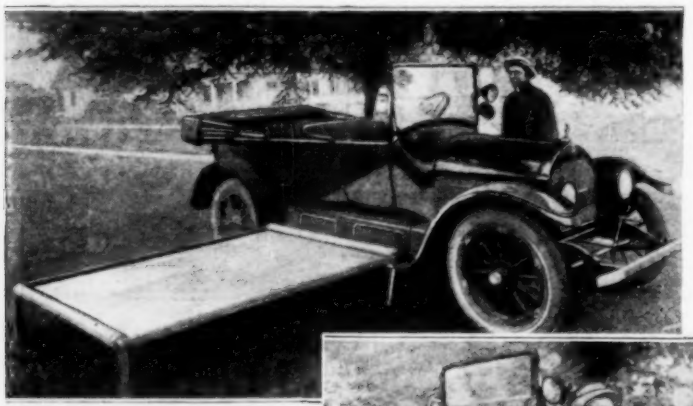


Attached to the Top of the Windshield, a Small Metal Plate, When Lowered, Shields the Eyes of an Automobile Driver from the Glare of Approaching Headlights

¶A cooked-food center, from which housewives can obtain complete meals ready to serve to the family, is a civic novelty boasted by the city of Buffalo, N. Y. The home-demonstration agent of the U. S. Department of Agriculture, the State College of Agriculture, and the Buffalo Home Bureau coöperate in handling the work.

ROADSIDE CAMPING OUTFIT FOR AUTO TOURISTS

Roadside camping is rendered comfortable by an outfit constructed at home by a western motorist for use when touring. As most of the equipment is carried on the running boards of a car, it does not mar the pleasure of traveling by crowding the occupants. Included in the conveniences are a bed, two cupboards, and a table. The bed consists of a wide strip of canvas, fastened to a roller on a running board, and a collapsible frame in which the cloth can be stretched by turning the roller. Legs support the frame at the end opposite the running board. The cupboards are placed on the other side of the car. When opened, the door of one cupboard forms a table. Food, table and cooking utensils, and other supplies can be stowed in the drawers of the cupboards. An ice box is included in the equipment.



This Picture Shows the Canvas Bed Extended, Ready for Use, in Its Collapsible Frame

A Roadside Meal: Here the Door of One of the Running-Board Cupboards is Serving as a Dining Table for the Inventor of the Automobile Camping Outfit and His Family

Ice-Lined Caves in Northeastern Iowa: At the Left Is the Entrance from Which a Current of Chilled Air Pours Constantly, Even in the Hottest Weather. Picnic Parties Gather on This Spot and Freeze Ice Cream, Using Ice Obtained from the Natural Refrigerator. Above Is a View of the Cave's Interior, Showing How the Walls are Perpetually Covered with a Coating of Ice

STRANGE ICE-LINED CAVERNS IN NORTHEASTERN IOWA

Primitive cold-storage cellars were provided by nature for the aborigines of northeastern Iowa long before the advent of the white race in that part of the country, and are still in existence, furnishing a puzzling problem for scientists who attempt to explain their formation. Briefly described, the refrigerated chambers are two ice-lined caves of undetermined size, in which the temperature is near the freezing point, even in the hottest weather. Fresh venison was stored in the cold caverns by the Indians in pre-pioneer times, and nowadays picnic parties freeze ice cream at their entrances, using ice chipped from the walls. The caves never have been thoroughly explored, but are believed to be extensive.

MEMORIAL BUILDINGS PLANNED FOR WORLD-WAR VETERANS

Instead of monuments of no practical value as memorials to local men who served in the world war, many communities will erect buildings of civic utility. Some of these will be in the form of community houses, in which there will be provided facilities for public recreational and social affairs. Other structures will be used for hospitals, libraries, schools, auditoriums, municipal offices, and other purposes. A campaign is in progress to encourage the choosing of the building type of memorial.

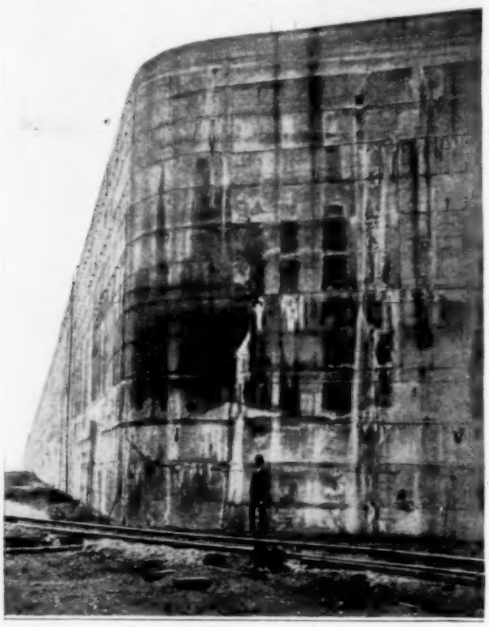
SWERVING MOTOR CAR WRECKS SPAN OF WOODEN BRIDGE

Freakishly swerving from one side to another of a wooden bridge over a small stream on the Pacific coast, an unmanageable automobile recently demolished the supporting trusses of one span, and caused that portion of the structure to collapse entirely. Though the car was twice on the very edge of the flooring, miraculously it did not leave the bridge. None of the occupants was injured, but the machine was badly damaged. When the vehicle came to a stop after the accident, it was nearly across the wrecked span, and stood diagonally across the roadway. How and why the automobile became unmanageable was not apparent.

Span of a Wooden Bridge That Collapsed After Its Supporting Trusses were Torn Off by an Unmanageable Automobile, Which, Though It Ran So Wildly Amuck, did Not Plunge Off the Bridge

ENORMOUS DOCK CONSTRUCTED IN CITY OF LONDON

London became a city of importance centuries ago, but it was not until recently that steps were taken to make



The Largest Vessel Afloat can be Accommodated in This Enormous Concrete Dock, Recently Constructed in London

the metropolis a real port, though proper berths for large ships have been practically the only deficiency. A huge concrete dock has just been completed near the heart of the ancient city, big enough to accommodate the most gigantic vessel, and within the near future any craft, regardless of size, will be able to discharge and load cargo within the world's most populous municipality. In the past the larger ships have docked at Tilbury, 26 miles down the Thames River.

PLAN TO RAISE GALVESTON OUT OF FLOOD REACH

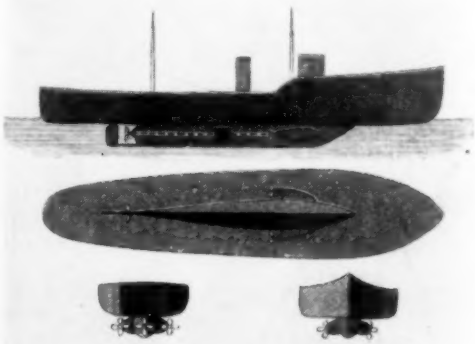
Still haunted by memories of the terrible flood of 1900, the city of Galveston, Tex., aided by U. S. engineers, is planning increased protection against the aggressions of the gulf seas. The most ambitious project is to raise the grade of the whole city by a uniform fill of eight feet, which would cost, it is estimated, some $15,000,000. The alternative plan would raise only the business district from 10 to 14½ ft., the difference being for drainage. This, it is thought, would cost but $5,000,000. Complete surveys are now under way.

FAMOUS CANADA TROUT STREAM TO BE HYDROELECTRIFIED

The hydroelectric invasion of Canada's romantic wilds grows apace. Now the project is to build a huge turbine plant on one of the world's most famous trout waters—the turbulent Nipigon River. This short stream, whose source, in Lake Nipigon, Ontario, is only 32 miles from its mouth, nevertheless is Lake Superior's largest tributary, and drops several hundred feet in its brief course. The plans, already under way, call for two 12,000-hp., 12,000-volt units at Cameron's Pool, below lakes Maria and Jessie, where a 65-ft. fall is available. A regulating dam will be installed to make reservoirs of the two lakes.

HOLLOW KEEL CARRIES SHIP'S MOTOR AND PROPELLERS

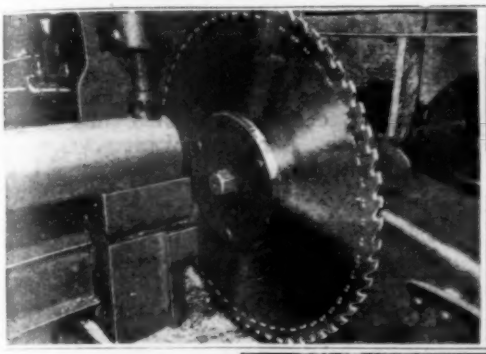
A hollow fin, which is applied to the bottom of a boat hull in place of a keel, and contains the driving motor, shaft, and propellers, forms the subject of a patent recently assigned to an eastern boat-building concern. The propeller may be located at the end of the main fin, or two or more auxiliary side fins may be fitted with a propeller apiece, their shafts driven by gears or chains from the motor shaft. Such a removable fin or hollow



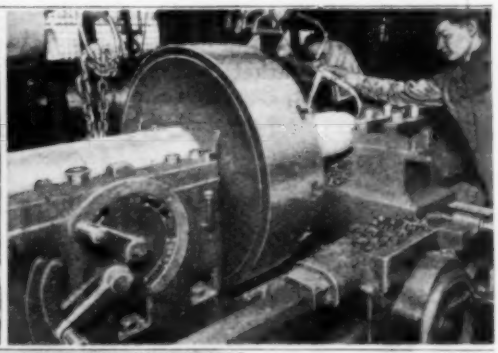
Side, Bottom, Stern, and Bow Views, Showing How the Hollow Fin Containing Motor and Propellers is Attached

keel, containing the entire motive equipment of a boat, may thus be applied to any hull desired.

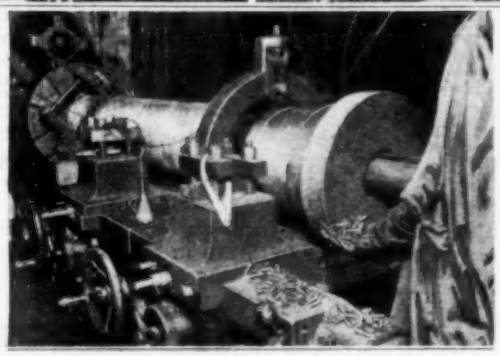
MODERN MECHANICAL WIZARD IS HIGH-SPEED STEEL



The Inserted Cutters of This 42-Inch Saw Are of High-Speed Steel, Nine-Sixteenths Inch Wide. The Bar being Cut Is Steel, 11 Inches in Diameter, and the Saw Goes Through an Inch a Minute



Here Is a Turning Operation on a Geared-Head Lathe, Running at 36 Revolutions per Minute. The Tool is Set to Cut One Inch Deep, Reducing the Diameter Two Inches at a Cut

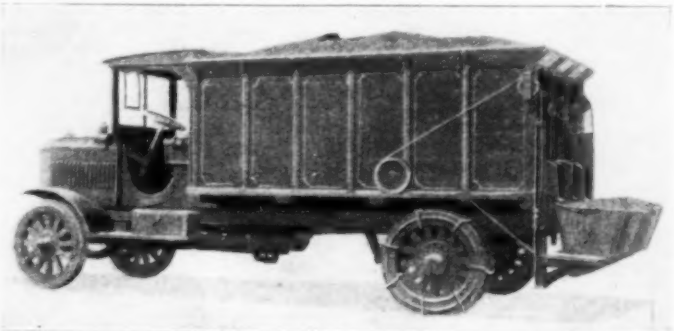


A Hydraulic-Press Cylinder being Bored from the Solid in Three Cuts Seven Feet Deep: The First Cut Makes a Hole Five Inches in Diameter, the Second Cut Enlarges It to Eight Inches, and the Third to Nine and Five-Eighths Inches. A Hog-Nosed Bit of High-Speed Steel on a Long Bar is Used without Lubricant, a Jet of Compressed Air Freeing the Cutter of Chips. At 10 Revolutions Per Minute the Feed Is Seven Thirty-Seconds Inch a Minute

Tools made of high-speed steel have such extraordinary capacity for eating into solid metal that their action is a perpetual novelty. In turning a shaft of silicon-carbon steel, for example, the tool is set for a cut of one inch, reducing the diameter two inches, and advances ⅛ in. at each revolution. A 42-in. saw with inserted cutters penetrates an 11-in. hard-steel bar at inch a minute. A hydraulic-press cylinder is bored in three cuts from the solid, with a hole 7 ft. deep and 9⅝ in. in diameter.

TRUCK PLATFORM ELEVATES COAL BASKETS

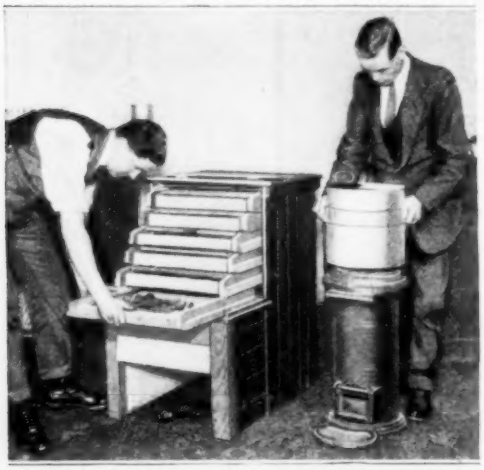
Numerous mechanical arrangements have been devised for the easy unloading of coal trucks, but few of them consider particularly the comfort or convenience of the "carry-in" man. A new form of truck has an elevator platform at the rear, on which the carrying baskets are placed. When the tail gate is lifted, the coal, which rests on an inclined false bottom, slides into the baskets. A power winch then hoists the platform to the height of a man's shoulder, and the carrier simply steps under a basket and walks away with it. This saves a great deal of muscular effort.



The Platform at the Rear of the Truck is Hoisted by a Power Winch Until the Baskets of Coal Are Level with the Shoulder of the "Carry-In" Man, Relieving the Strain of Lifting. The Coal Rests on an Inclined False Bottom, and Slides into the Baskets

COMPACT FRUIT-DRYING SET GIVES HOME EMPLOYMENT

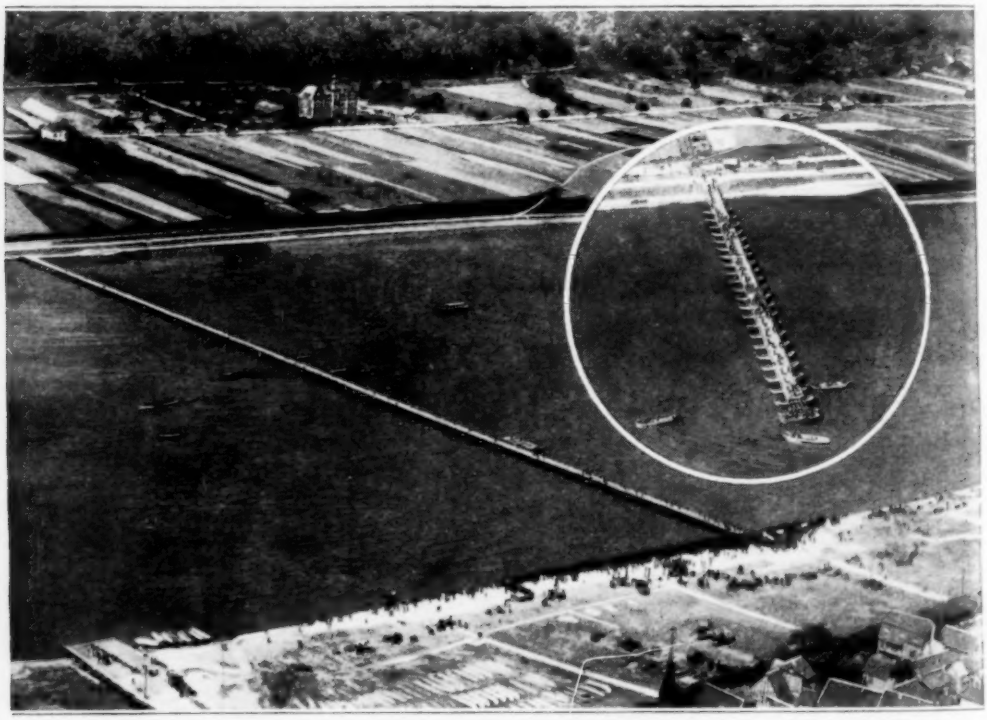
An enterprising English concern, in establishing a market for its patented fruit-drying outfit, has been the means of giving home employment to a number of discharged soldiers. The set consists of an evaporating cabinet with sliding trays for the fruit, and a closed receptacle for steaming. The home worker who buys it is able to dispose of the product through a central market operated for that purpose. A course of instruction accompanies the outfit.



The Fruit-Evaporating Cabinet at the Left with Its Sliding Trays for the Fruit and the Steaming Receptacle on the Stove at the Right Make a Compact Set for Home Work

YANKS THROW PONTOON BRIDGE OVER RHINE IN RECORD TIME

It is recorded that a German regiment of engineers once threw a pontoon bridge across the Rhine in one hour and 30 minutes—which is very creditable when it is remembered that they had been in training for only 40 years. Unfortunately, however, the 2nd Regiment of Engineers, A. E. F., later found at their disposal both the German pontoon equipment and the river Rhine. So they decided to beat the German record. Working at double time, the citizen-soldiers completed the job in 50½ minutes. This world's record was established at Hönningen, just a few miles north of Coblenz.



These Aerial Photographs of the River Rhine Show the Pontoon Bridge Thrown Across by American Army Engineers in the Record Time of 50½ Minutes. Not One Mishap or Delay Marred the Splendid Performance. The Smaller Photograph, Taken a Few Minutes after the Starting Signal, Shows the Pontoons Drifting into Position, Beams and Planks Dropping Swiftly into Place

FIRST-AID METHODS FOR AUTO EXHAUST-GAS POISONING

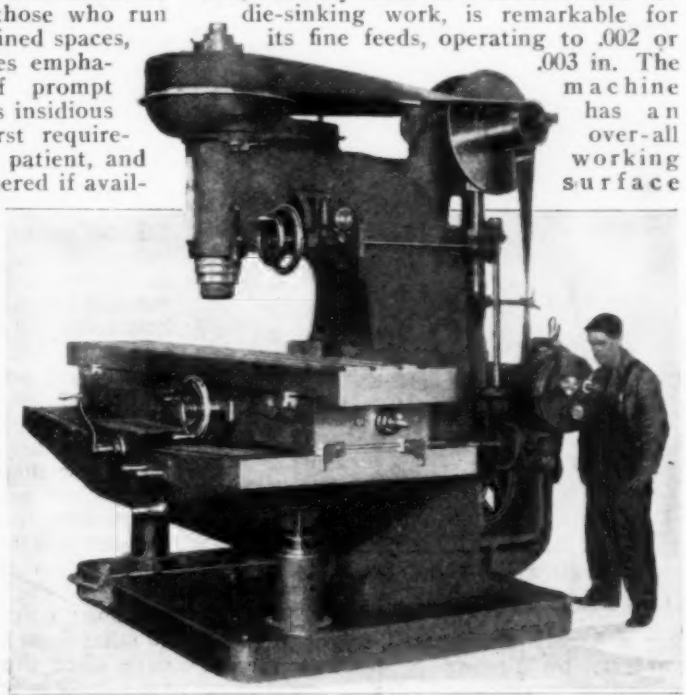
Recognizing the serious and often unsuspected danger of carbon-monoxide poisoning that confronts those who run automobile engines in confined spaces, the U. S. Bureau of Mines emphasizes the importance of prompt attention to victims of this insidious gas. Fresh air is the first requirement for the unconscious patient, and oxygen should be administered if available, but no delay is permissible. Approved methods of artificial respiration should immediately be applied, if natural has ceased, and continued for at least three hours, as the blood cannot absorb oxygen until emptied of carbon monoxide. Hot-water bottles, or substitutes, and warm covers should be used, but no liquids should be placed in the mouth until consciousness is fully restored. The patient should be kept in a horizontal position, and moved only with a stretcher. Sitting or standing may cause a relapse, possibly fatal. It should be remembered that carbon monoxide is odorless, and gives no warning of its presence.

GEOLOGISTS SAY OCEAN'S AGE IS NEAR NINETY MILLION

Though scientists differ by a few million years in their estimates of the ocean's age, their figures really vary not more than 10 per cent, the average, as lately announced, being rather more than 90,000,000 years. The use of the word "estimate" is apt to obscure the fact that the calculations are wholly mathematical, and based upon carefully studied data. It is known that the saline constituents of the sea are deposits continuously being made by the rivers, and that the ocean, therefore, constantly grows more salty. Since tests have been made which give the figures for the amount of saline material carried by the streams, their annual burden of salt is merely divided into the amount now in the ocean.

ENORMOUS MILLING MACHINE IS FINE PRECISION TOOL

A vertical milling machine of enormous size, recently built in Massachusetts for die-sinking work, is remarkable for its fine feeds, operating to .002 or .003 in. The machine has an over-all working surface



Huge Vertical Milling Machine, Approximately 10 Feet High and Weighing 18,000 Pounds, Which Works to Thousandths of an Inch: The Telescopic Screws Supporting the Knee, or Bed, are Power-Operated

110 by 20 in., its table surface being 96 by 20 in. Its approximate height is 10 ft. and its weight over 18,000 lb. The knee, or adjustable bed, is supported by two large telescopic screws, one at each end, which are driven in unison by power, controlled by a handwheel in front. The heavy 96-in. saddle bears on the knee at three points, center and ends, giving great rigidity. The machine is driven by a 10-hp. electric motor, mounted on a bracket at the rear of the machine and belted to the milling head, and all controls are so located that the operator can reach them from the best position for watching the work.

¶Hose pipe intended for trench use, made of rubber-impregnated canvas reinforced with iron wire, is being salvaged by the hundreds of miles in England. A special machine dismembers the hose, and the iron brings about $60 a ton, while the canvas goes to make cellulose after the rubber is reclaimed.

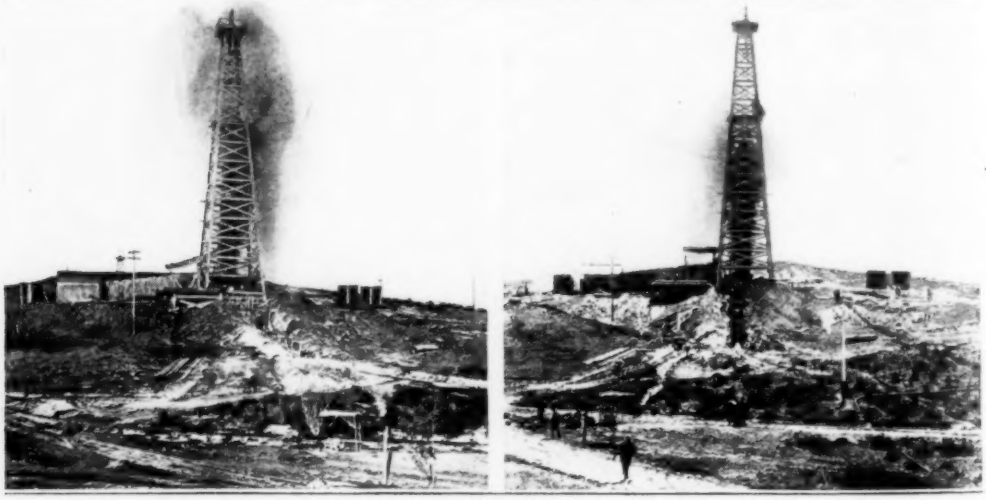
PUMP WATER FOR IRRIGATION WITH GASOLINE ENGINE

A voyager on Okanagan Lake, in the mountains of British Columbia, approaching a lonely shore, well might register surprise on finding a gasoline engine pounding away unattended at its task of driving a three-plunger force pump. It is an expensive method of irrigating, but the only one available to the farmers on the high plateau, 150 ft. above the lake. The intake is 40 ft. out in the lake, and the water is delivered through a two-inch pipe buried six inches in the bank. The rainfall of the region is only 10 in. a year, but with the pump supplying ample water, remarkable crops of fruit and vegetables are raised, a single garden patch not infrequently yielding peaches, apples, melons, potatoes, and corn.

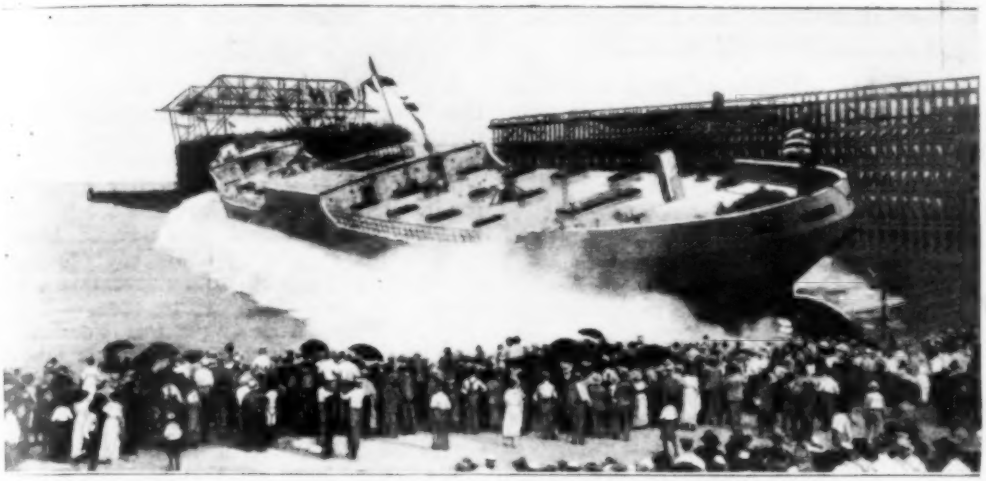
Three-Plunger Force Pump, Driven by Gasoline Engine, Used to Supply Water for Irrigating a Farm at the Top of the High Bank in the Background

THROTTLE GUSHING OIL WELL AFTER SIX-DAY STRUGGLE

Impelled by some unexplained subterranean force, a four-months-old oil well at Whittier, Calif., without warning increased its theretofore steady rate of flow from 500 to 8,000 bbl. daily, not long ago, with the result that a vast quantity of oil was lost before the torrent could be throttled. The gushing began so suddenly that it was impossible to reach the regulating valve, located in a pit at the mouth of the well, before the excavation was filled. Oil shot up 70 ft. at first, but after the pit had been drained the unimpeded stream mounted higher than the top of the 112-ft. derrick over the well. Spray from the tremendous column was carried as far as 10 miles from the scene by the wind. Six days after the gushing began, workmen succeeded in fastening a 40-ft. pipe across the end of the well casing, retarding the flow of oil to such an extent that soon afterward the well was brought under complete control.



For Four Months After It was Drilled, the Oil Well Pictured Here Produced 500 Barrels Daily. Then It Suddenly Began to Gush, Pouring Out 8,000 Barrels in 24 Hours. Six Days were Required to Throttle the Increased Flow



GREAT CONCRETE VESSEL LEAVES WAYS AT SOUTHERN SHIPYARD

EXPERIMENTS are no longer necessary to prove the worth of the concrete ship. In repeated trials it has vindicated the claims of its friends and refuted the slander of its enemies. The vessels have shown themselves to be stanch and seaworthy, capable of weathering any storm, and possessed of many desirable qualities not found in craft of steel or wood. Another addition to the growing number of these modern marine productions was made recently when the hull of the giant steamship "Latham" was launched successfully at Mobile, Ala., for the Emergency Fleet Corporation. This was the second concrete ship to slide into the water at the southern shipyard, the first having been launched several months ago. A third hull is being constructed there, and is expected to be ready to leave the ways in the near future.

AERIAL LEAGUE IS PLANNING TRANSCONTINENTAL DERBY

Prizes aggregating more than $100,000 are to reward the winners of the transcontinental Derby planned by the Aerial League of America. The ambitious project, like the Toronto-New York handicap, will test the efficiency of various types of planes, in addition to intensifying public interest in aviation. With this last end in view the promoters have decreed that the long race be divided into legs of 250 miles each, with a compulsory stop at the end of each leg. Prizes will then be awarded by a point system, contestants being graded on the performance of each leg. Rear Admiral R. E. Peary is to choose the committee which will establish landing places, at intervals of 50 miles, along the Woodrow Wilson transcontinental airway.

MOTOR-CAR ACCIDENT SHOWN BY MECHANICAL SIGN

Careless pedestrians and reckless automobile drivers were shown the folly of their ways by means of a mechanical signboard during a recent anti-accident campaign in Detroit. A miniature motor car, fastened to a moving belt, ran swiftly across the face of the board, painted to represent a street intersection, and on each trip knocked down a figure which was supposed to be a man standing outside the space outlined as a safety zone for persons on foot. An electric motor behind the board actuated the belt.

Mechanical Signboard in a Detroit Park, Representing a Street Intersection, on Which a Miniature Automobile Accident is Enacted by a Tiny Motor Car and the Small Figure of a Man

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

FRENCH MEMORIAL DIPLOMAS ARE SACRIFICE RECORDS

France has officially adopted a design for a memorial diploma, on which are

BY COURTESY OF L'ILLUSTRATION

Memorial Diploma being Distributed by the French Government to Schools and Public Halls for Inscription with the Names of Fallen Heroes

to be inscribed the names of those patriots from each community who made the final sacrifice in the war, and 200,000 of the parchments are being distributed to schools, and city and county halls. In the design, Victory writes the names of the heroes within an arch, guarded, at the right, by a sentinel poilu and surmounted by the watchful figure of the lion of Belfort, while at the foot France mourns. An inscription reads "All France Stands Up for the Victory of Right."

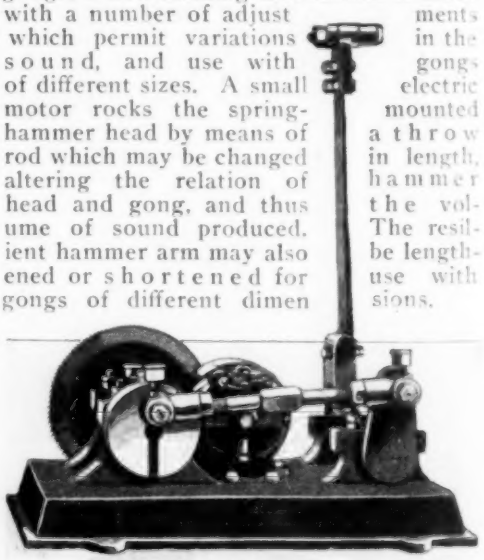
¶Claims are being filed in Mexico on deposits of oil believed to be of great importance, newly discovered in the vicinity of Mapimi, Durango. Some concessions have been granted, and are practically ready for operation. The district is near a large mining section, and has railroad connection with Monterey.

PICK EGGS WITH TWEEZERS FOR LIVING

Nimble-fingered girls are employed in the Washington state fish hatcheries for picking eggs—the eggs of salmon. This work requiring delicate manipulation, women and girls are peculiarly adapted for it. The eggs to be hatched are placed in long troughs, and as some of them turn white, indicating that they are not fertile, it is the duty of the feminine employes to spot these white eggs, which they pick out with tweezers. Formerly men did the work, but when male labor sought more profitable employment during the war, women efficiently filled their place and even some of the female inmates of the Western Hospital for the Insane were used on this particular job, with benefit to themselves, for they like the work, and it keeps them in good physical condition. Also, since about 80,000 lb. of fresh salmon from the hatcheries go to the hospital each year, their employment means an economy to the state. One of the women last year picked 3,500 eggs, which is a record.

FIRE-ALARM HAMMER DRIVEN BY ELECTRIC MOTOR

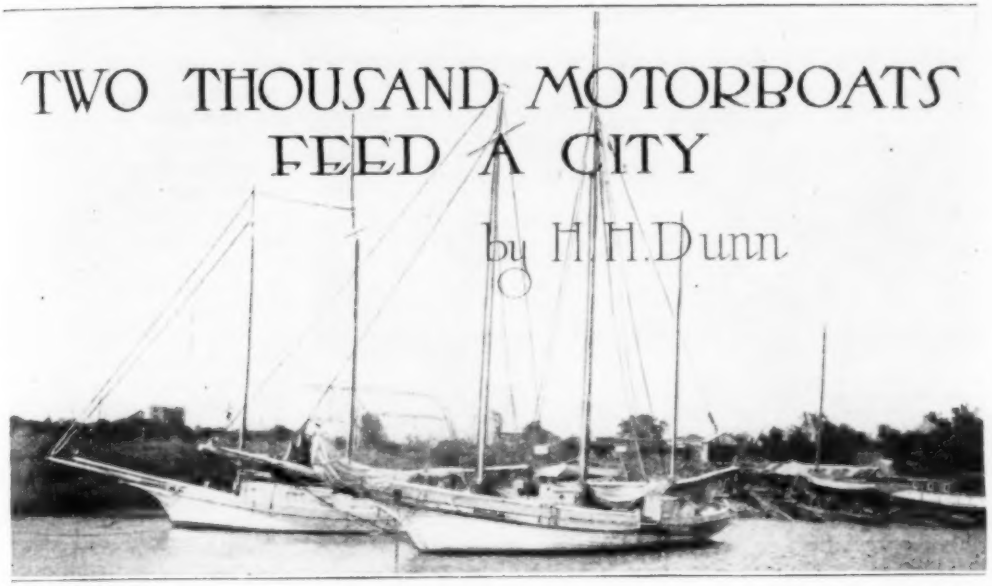
Intended for use with large fire-alarm gongs, a new striking mechanism is made with a number of adjustments which permit variations in the sound, and use with gongs of different sizes. A small electric motor rocks the spring-mounted hammer head by means of a throw rod which may be changed in length, altering the relation of hammer head and gong, and thus the volume of sound produced. The resilient hammer arm may also be lengthened or shortened for use with gongs of different dimensions.



By Varying the Length of the Throw Rod the Reciprocating Hammer Arm is Made to Hit the Fire-Alarm Gong with More or Less Force, Thus Altering the Volume of Sound Produced

TWO THOUSAND MOTORBOATS FEED A CITY

by H. H. Dunn



Motorboats with Masts and Sails, Called "Auxiliaries," are Used to a Large Extent for the Transportation of Freight and Lumber on the Lakes of Louisiana. The Fleet of Them Seen Here Is in Bayou St. John, in the Heart of the City of New Orleans, Where They Make Their Headquarters

AT the lowest possible estimate, one-fourth of the food the 400,000 inhabitants of New Orleans eat is brought to them by motorboat, and it requires 2,000 of these, working every day in the year, and some nights, to fill the demands put upon them. This is the largest fleet of working motorboats gathered at any one point in the world. They range from cross-river ferries devoted to carrying fish, vegetables, sugar, and rice from the heads of the canals on the west bank of the Mississippi, to the markets on the east, to larger and smaller boats making 150-mile runs south and west through the great 5,000-mile grid-iron of canals, bayous, rivers, lakes, and bays that make 12,000 square miles of Louisiana a marsh whose only connection with the outside world is by water.

Market men and motorboat builders and owners of New Orleans estimate that the boats, none of which is more than 80 ft. long—most of them only about 30 ft.—last year carried produce and merchandise worth $17,000,000 between the farms, fisheries, and settlements of southwestern Louisiana and New Orleans. This does not take into account the hundreds of thousands of dollars' worth of oysters carried to Houma, the second oyster port in the world, nor the vast quantities of sea food that go to the packeries on the gulf coast outside of Louisiana.

Much mail is also carried on these boats, and, besides, they furnish transportation for hundreds of passengers.

Dispatch Boat on the Barataria and Lafourche Canal, One of a Number Belonging to the Canal Owners, and Used to Keep the Waterways in Order

The boats from the Barataria section, in 1918, carried to New Orleans more than $250,000 worth of potatoes alone, and those from Grand Isle, about 100 miles from the Louisiana city, brought to it 60,000 crates of cucumbers, valued at about $300,000. Cauliflower from the same place amounted to $310,000, and the celery from southwestern Louisiana added approximately $150,000 to the value of the vegetables handled. It must be remembered, too, that on their return trips the boats carry to the villages merchandise, clothing, shoes, and other commodities worth nearly as much as the produce they bring to the city. Practi-

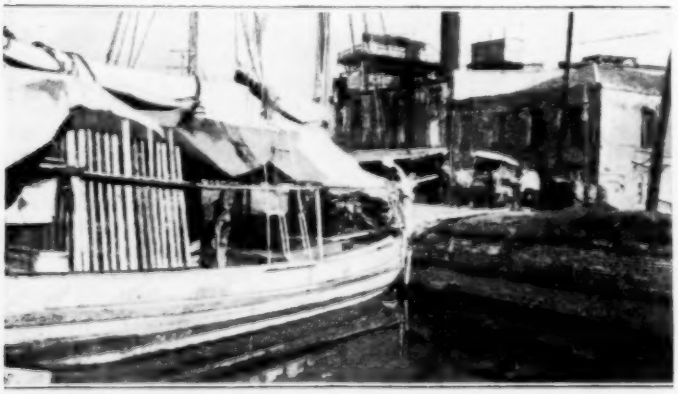
One of the Many Motor Freighters of New Orleans, on the Barataria and Lafourche Canal: The Boat is Making One of Its Regular Cruises to Morgan City, Which Is About 150 Miles from New Orleans. Just at This Point the Canal Crosses the Bayou Lafourche at Tide Level

cally all the building materials which are put into the homes and business structures of these villages, into the bridges which carry the few wagon roads across the streams, and into the very boats by which this large traffic is carried on, are transported the same way.

This fleet, which represents an investment of more than $1,000,000, and costs close to $100,000 a year in upkeep, may be roughly divided into three classes: First the fishing boats, engaged in catching the fish, seining the shrimp, and tonging the oysters of southwest Louisiana, and in bringing them to New Orleans; second, the motor freighters, which, ordinarily, ply routes as regular on schedules as fixed as those of ocean liners, and form virtually the only connection of thousands of families with the outside world; and third, the large fleet of miscellaneous craft used as dispatch boats by the canal companies, as messenger boats for the sea-food packeries; this class including the fleet of 12 patrol boats, maintained by the State Department of Conservation, which, having control of all the natural resources of Louisiana, is a sort of guardian angel for the whole work fleet.

The fishing boats are of two kinds, those engaged in catching the fish, oysters, and shrimp in the sea and the bayous, and those to which this product is transferred to be rushed to the New Orleans market or to the various packing plants. The former seldom appear in New Orleans, though they all hail from that city as their home port. The latter consist of the long, slender, swift oyster runners, which, leaving the rim of the gulf at nightfall with four or five tons of iced oysters or shrimp, are in New Orleans, 110 miles away, at four o'clock the next morning; and of the heavier, slower freighters, which bring from 10 to 20 or 30 tons of fish, packed in ice, at much slower pace, to be sold for hotel and restaurant, and packing purposes. The engines of the "runners" are all gasoline-burning, and of lighter-duty type than those of the larger, slower boats, which usually have heavy-duty motors, frequently driven by kerosene instead of gasoline, and not infrequently adapted to both fuels.

The freighters range more to the north, through the sugar, rice, and farming country, and instead of tying up at the heads of the canals which lead from the Mississippi into the hinterland of Louisiana, dock at the city side of the river, where a wharf, nearly two blocks long, known as the Bienville Street Landing, is reserved for their exclusive use. Most of these boats are of heavy construction, built to withstand the severe storms which sweep the gulf coast and farther inland over the flat lands. They average about 80 ft. in length, driven by gasoline, kerosene, producer-gas, or even, now and then, a crude-oil engine. The two canals, the Harvey's, and the Barataria and Lafourche,



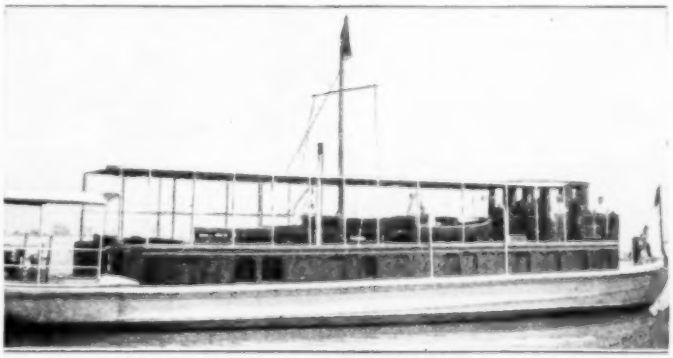
Charcoal and Fire-Wood Schooner with Auxiliary Engine: Much of New Orleans' Fuel is Brought to the City by Boats of This Kind

run west, like trunk lines of a railroad, from the Mississippi River, into which they lock at New Orleans, crossing all the main north-and-south natural waterways, such as the Bayou Lafourche, Bayou Barataria, Bayou Terrebonne, the Atchafalaya and Vermilion rivers, and a myriad other smaller streams, which give to the gulf on the south, and run into the "sugar bowl" on the north. Along these trunk-line canals the freighters operate, going up and down, at the tide-level crossings, on the streams they meet, to the scores of small towns and even cities like Houma, Morgan City, Lake Charles, and Lockport, as far north as Donaldsonville.

A Few of the Motor Freighters Which Connect Scores of Settlements in Interior Louisiana with the Market at New Orleans, Where They are Seen Docked at the Bienville Street Landing

All the way they distribute merchandise from New Orleans, carrying everything from arsenic for the trappers to zithers for the trappers' daughters. Almost every one of this fleet is a mail boat, and every one furnishes free transportation to the fathers of the church who travel hundreds of miles over the inland waterways to baptize, marry, and bury. Seaworthy boats they are, with hulls built of 2-in. cypress, reinforced with oak; turning back for few storms, and many of them with 25 to 30 years of constant daily service behind them. The majority were originally sailing craft, known as "luggers," whose owners installed internal-combustion engines as soon as these motors became commercially practical.

Probably seven-eighths of the total fleet of motor work boats at and around New Orleans are in these two classes, while the third consists of, say, 250 boats which represent the "class" of the fleet. That is to say, they are high-speed dispatch boats, doing their 25 to 30 miles an hour, carrying the owners, managers, and superintendents of the canals along the waterways, where dredges and "lily-boats" are constantly at work keeping the channels deep enough and destroying the rafts of floating water hyacinths which work such havoc with propellers and shafts of small craft. Among them are also a number of comparatively fast boats used by traveling salesmen, who find them swifter, more economical, and with more facile schedules than the regular boats, or even the railroad trains. Frequently they drive them themselves, carrying their samples, no matter how bulky or how heavy, right with them. Such boats make their headquarters in either the New Basin Canal or the Bayou St. John, both of which penetrate the heart of the city of New Orleans, each connecting a railroad station with Lake Pontchartrain; or in the headwaters of the Harvey, or the Barataria and Lafourche canal, on the other side of the river, easily accessible by ferry. The average value of these boats is probably



Motor Flagship of the Louisiana State Department of Conservation, Which Keeps Guard over the Fishing Fleet, the Banks, and the Oyster Beds

slightly higher than that of the work boats proper, ranging from $750 to as high as $1,200.

In this class also belong the motor tugs, which are slowly but surely replacing steam tugs for all the lighter work of the port; the ship chandlers' boats, and the dispatch boats used constantly by firms who have their offices in New Orleans and their plants in Algiers, Gretna, or Westwego, across the river. Nor should the big steel self-propelled barges, ranging from 250 to 700 tons, be forgotten. They bring coal and iron ore from the Alabama fields to New Orleans, and carry back merchandise to all the towns along the coast of Mississippi Sound, and up the Mobile and Warrior rivers in Alabama. They do not, of course, belong to the fleet which feeds New Orleans, yet New Orleans is their home port, and they handle a huge and profitable traffic of coal at greatly reduced freight rates. These big barges, driven by gas-producer engines, are worth from $50,000 to $75,000 each.

Vegetable-Carrying Motorboats from Grand Isle and the Barataria Districts, being Locked Through from New Orleans into Harvey Canal

Neither should one overlook, in considering the size and the work and the value of the motorboat fleet of New Orleans, the 200 or 300 boat yards, which, scattered from New Orleans west to the Sabine River of Texas, north to the Red River, and south to the rim of the Gulf of Mexico, build this fleet and keep it in repair. Most of these yards have been in the same family since the days of the Louisiana Purchase, or shortly thereafter, and through generations their owners have learned to build exactly the boats suited to the work in hand, boats which far outlive their builders or their original owners, and earn tremendous profits on their first cost as their years of useful service increase.

GATEWAY TO OLD CEMETERY OUTLASTS ADOBE WALL

Time and the elements have almost destroyed the adobe wall around one of the oldest cemeteries in the country, located near Taos, N. M., but the gateway to the burial reservation still stands, its locked doors supported in a small section of the crumbling inclosure. Barbed wire replaces the wall of sun-dried brick.

Gateway to an Old New Mexican Cemetery Which has Survived the Adobe Wall in Which It was Set and Many of the Crosses in the Graveyard

SOUTHERN SWAMPS FURNISH LIZARDS FOR GREENHOUSES

Having received orders for several thousand lizards, a New Orleans concern has advertised for a number of men and boys to assist in searching the near-by swamps for the elusive little reptiles. The only qualification demanded of the would-be lizard hunter is that he have more "pep" and agility than the lizard, which he must catch bare-handed. The company ships the lizards in large quantities to greenhouses in the North and East, where the little animals earn their board by ridding the plants of insect pests. A smaller number are sold as pets. The lizards abound in this section.

¶Sighting an eagle high above Atlantic City, N. J., a number of airmen armed themselves with shotguns and gave chase in their airplanes. The bird escaped.

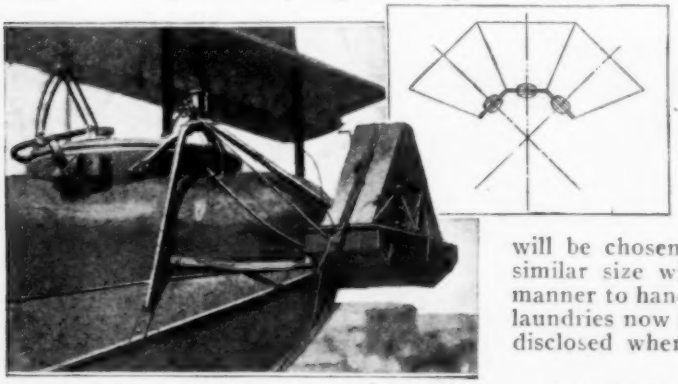
DESTROY BIG BUILDINGS TO WIDEN RIVER BED

The Scioto River at Columbus, Ohio, is Now Flowing through a Recently Made Cut That Forms Part of Its New and Exceedingly Expensive Channel. In the Stream are Still to be Seen the Wrecks of Bridge Piers Destroyed by the Disastrous Flood Six Years Ago. The City has Purchased All Property on This Bank, the West, for 300 to 500 Feet Back, and is Now Wrecking the Buildings

Nearly 500 Buildings are Included in the Strip of Property to be Cleared to Make Way for the New River Channel, and Many of Them Were Very Valuable. The Laundry Whose Stack Alone Remains Standing in the Picture, Cost the City $65,000, and a Big Chain Factory was Condemned at an Appraised Value of $200,000. The Work of Changing the Industrial District into a River Bed is Expected to Take Another Two or Three Years

TRIPLE CAMERA FOR AIRPLANE MAKES WIDE, ACCURATE MAP

An aerial map-making camera of new design in use by the army engineer corps



Airplane Camera with Three Lenses, Which Point Downward at Different Angles, as Shown in the Diagram, Covering a Strip Three and One-Half Miles Wide at a Height of Only 4,000 Feet

operates with three lenses arranged at such angles that their fields lie side by side. As a result, at a height of only 4,000 ft., a map strip covering a width of three and one-half miles may be taken, the three sections matching perfectly. So accurate are these maps that when one of the city of Washington, recently made, was checked against a survey map of the usual type, it was found that all points exactly coincided. The system is used not only for military purposes, but for plotting the routes of the aerial mail service.

OCEAN SOUNDED BY ECHOES FROM BOTTOM

By sounding with sound waves instead of a steel cable a Frenchman has been able to determine the depth of the ocean in a few seconds where the ordinary process requires minutes or hours. In contrast to the usual equipment of cable, reels, and donkey engine, he equips himself simply with a quantity of high explosive, a microphone, and a chronometer. Detonating a charge of explosive in the wake of his moving vessel, he hears in his microphone both the noise of detonation and the echo produced by reflection from the bottom. Reading the time interval from the chronometer and knowing the speed of sound in water he is able to calculate the ocean's depth at that point. Tests have shown that the method yields sufficiently accurate results for practical purposes.

MOBILE LAUNDRIES ORDERED TO MEXICAN BORDER

Mobile laundries will soon be in operation near the Mexican border for the convenience of American troops on patrol duty in the troubled region. A recently issued order authorizes the organization of six companies of 37 men each to take charge of the work. Especially qualified members of the Quartermaster Corps will be chosen. Six other companies of similar size will be formed in the same manner to handle a like number of mobile laundries now in storage. It has not been disclosed where these will be sent.

SHIFTER FOR POWER BELTS ACTS AT TWO POINTS

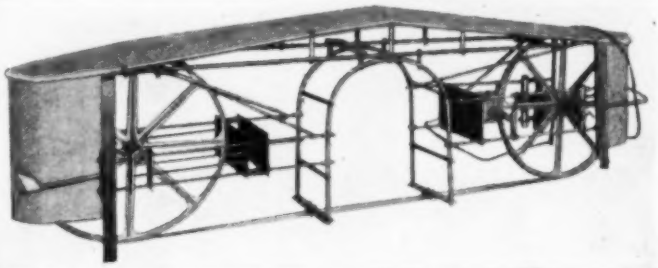
Belts are shifted simultaneously on overhead power-shaft pulleys and machine-driving pulleys by a device recently developed by an Ohio manufacturer. Two duplicate sets of gears are used, one near the shaft and the other near the machine. These are connected by a rod that synchronizes their action. When a crank on the lower set is turned, belt guides above and below move in unison across tracks which parallel the power shaft, sliding the belt from one position to another. The mechanism is especially adapted for use with stepped pulleys. It can be adjusted for belts of different widths. Time is saved and the danger of accidents reduced by the shifter, which requires little attention.

¶ Carbon tetrachloride, commonly used in the familiar forms of portable fire extinguishers, is partly decomposed by contact with red-hot iron or blazing wood, and poisonous gases are liberated in small quantities, according to the findings of the U. S. Bureau of Mines. Such apparatus, therefore, should be used with care in inclosed places.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

PORTABLE BAND SAW DRIVEN BY ELECTRIC MOTOR

A portable, electrically driven band saw for felling trees has been designed by a Texas lumberman. The endless cutting blade runs on two wheels that are mounted at opposite ends of an iron-pipe frame. In the center of the frame, the band passes through slots, which turn it to the proper position for cutting when the contrivance is applied to a tree. Power is furnished by an electric motor, the shaft of which bears on the rim of one of the drivewheels. Insulated wires are attached to a feed line and strung on trees to the scene of operations.



Trees can be Felled by Electricity with This Portable Band Saw. The Driving Motor is Mounted on the Pipe Frame near the Wheel on the Right. A Texas Lumberman Designed the Contrivance

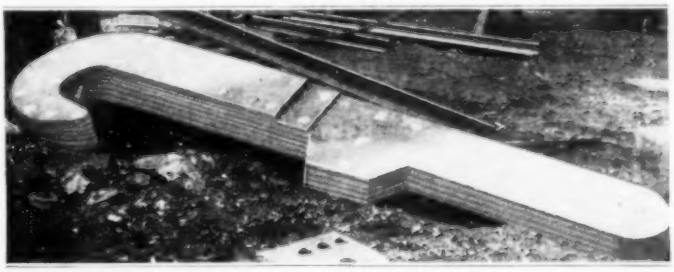
NAVAL AIRMEN'S BARRACK EQUIPPED LIKE CLUB

Naval airmen who are quartered in the officers' barrack at the naval station at San Diego, Calif., will enjoy living and recreational advantages equal to those of the best equipped men's clubs. The barrack, which cost about $500,000, is nearly ready for occupancy. It is a fireproof structure, and of Spanish architectural design. Besides comfortable sleeping rooms, the building contains a swimming pool, a library, billiard and pool tables, a gymnasium, and a bowling alley.

Equipped and Furnished Like a High-Class Men's Club, This $500,000 Barrack, Nearing Completion at the United States Naval Station at San Diego, California, will House Officers of the Naval Air Service. It is a Fireproof Building

SCRAPPED SHIP PLATES MADE INTO CRANE HOOKS

Salvage of scrapped material and economy of operation are the watchwords of modern factory management. An example of both is furnished by a shipyard that uses the oxyacetylene-cutting process in converting old ship plates into large crane hooks. These hooks are 8 ft. long and consist of six full-length layers of plates and four shorter ones, all held together by countersunk rivets. The four inner plates are of ½-in., and the two outer plates are ⅞-in. material. Half-length plates, ½ in. thick, adjoin the outer plates on either side, while two shorter plates, ⅞ in. thick, reinforce the hook proper.



This Big Crane Hook Cost Little to Make, as Old Ship Plates of Steel were Utilized, First being Cut into Proper Shape with an Oxyacetylene Torch, and Then Fastened Together with Rivets. It is Eight Feet Long and Strong Enough for Any Load

SMALL MUSEUMS ENCOURAGE NATURAL-HISTORY STUDY

The study of natural history is encouraged in some Russian cities by means of miniature museums, which are nothing more than large glass show cases, located in public squares, vacant store rooms, and other places where people in large numbers congregate or pass. These are filled with specimens taken from the larger exhibition places. Pedestrians with a few moments to spare find it profitable to loiter in front of the convenient displays to study the stuffed birds and animals under the glass. The contents of the cases are changed weekly, thus providing new and interesting exhibits at frequent intervals. Lectures are given at the small museums at noon hours and on holidays. The large museums have not been closed, though fewer persons visit them than before the establishment of their smaller counterparts.

Lecturer in a Russian City Describing the Contents of a Street-Corner Natural-History Museum to an Interested Audience of Pedestrians. The Lectures are Given at Noon Hours and on Holidays

CONCRETE BRIDGE IN SWEDEN ONE OF WORLD'S LARGEST

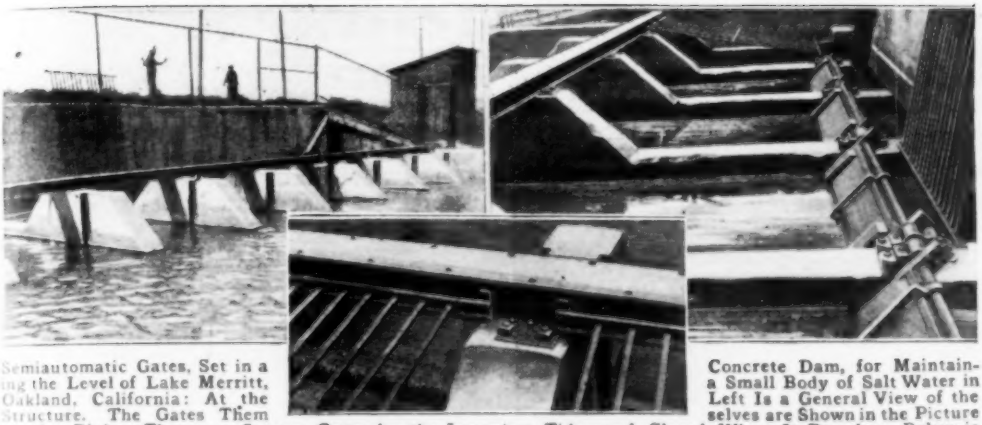
One of the longest reinforced-concrete railway bridges in the world has just been completed in Sweden, crossing the Ore River. The arched span of the new bridge measures 297 ft. 6 in., and it is built to carry trains running at speeds above 60 miles an hour, with axle loads of 20 tons. The construction cost nearly $560,000, the original estimate, made before the war, being $227,800.

SIMPLE INSTRUMENTS DETECT COMBUSTIBLE GAS IN AIR

Detection and measurement of minute quantities of illuminating gas, carbon monoxide, hydrogen, and other inflammable gases in air, are made easy by simple instruments recently developed by the U. S. Bureau of Standards. All three forms depend upon the heat-producing absorption of such gases by platinum. In one, four platinum wires form the arms of a Wheatstone bridge, two opposite wires being exposed to the air under test. Absorbed gas increases the resistance, giving a positive indication at a distance. A portable form has two loops of platinum wire heated by a battery. The glow of the wires is balanced by rheostats. When one wire is exposed and absorbs gas, less current is required to make it glow, and the rheostat adjustment indicates the amount of gas present. A third form uses a bimetallic thermostat to reveal the relative heat of the two wires, and, if desired, to ring an alarm. The first form may be arranged to report from several points at once.

AUTOMOBILE RADIATOR CAP CONDENSES VAPOR

Loss by evaporation of water, or antifreezing solutions, from automobile cooling systems is said to be prevented by a new radiator cap, which consists of several flat, circular chambers, placed on top of one another, and connected with a threaded cover that screws into the radiator inlet. Vapor condenses in the chambers and returns to the radiator as liquid. A whistle which is blown by vapor pressure is incorporated in the device as a heat indicator, and gives a shrill warning note when overheating threatens.



Semiautomatic Gates, Set in a ing the Level of Lake Merritt, Oakland, California: At the Structure. The Gates Them on the Right. They are Swung Open by the Incoming Tide, and Closed When It Recedes. Below is Illustrated the Top of One of the Abutments

Concrete Dam, for Maintain- a Small Body of Salt Water in Left Is a General View of the selves are Shown in the Picture

BEAUTIFUL LAKE HAS MANY IMPROVEMENTS

By C. W. GEIGER

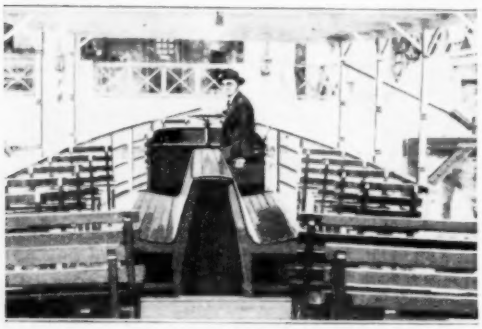
THERE are a number of things about Lake Merritt, the beautiful 170-acre body of salt water situated near the heart of Oakland, Calif., that distinguish it from the ordinary. Possibly the most interesting of these is the semiautomatic level control, which prevents the lake from falling when the tide in San Francisco Bay, its source of water supply, is flowing seaward. Four swinging gates, requiring but little attention from their attendant, and set in a concrete dam at the point where the lake connects with the bay, open by water pressure when the tide rises, but close when it recedes. Provision is made for repairing the gates by shutting the water off from them with boards slipped between two of the abutments of the dam. If it is desired to lower the level of the lake, the gates may be opened.

Another unusual utility to be seen at the lake is a wooden apron, or platform, which raises small boats out of the water for painting or repairing. Boats are floated over this platform while it is submerged. Two jacks of special construction raise the platform and its burden clear of the water. The jacks have long geared bars running through them, allowing a drop sufficient to submerge the platform, which is attached to the bars by strong chains.

Danger of drowning or accident on the lake is lessened by an alarm system similar to the regulation fire-alarm system. Alarm boxes are placed at 11 points on the shore of the lake, these being connected with a location-registering apparatus at a life-saving station. A speedy motorboat, manned by life-savers and equipped with grappling hooks, is sent out when an alarm box is operated. In order to provide more seating room on

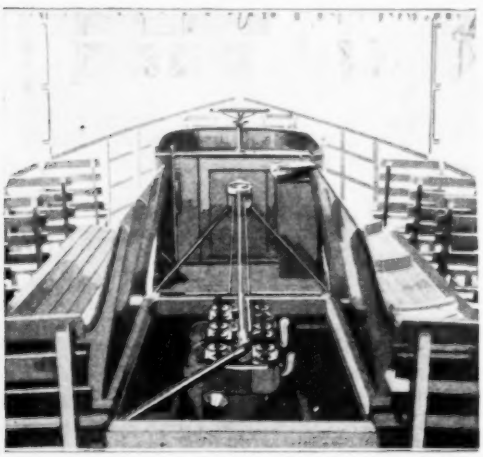
Dry Dock for Small Craft: At the Left a Rowboat has been Raised from the Water on a Submersible Platform Provided Especially for the Purpose. Jacks, Which Attach to the Sides of the Apron with Chains, are Used to Raise It. A Closer View of the Device is Presented on the Right

a motorboat running on the lake, a settee, made in two sections, was placed over



The Seating Capacity of a Launch Which Runs on Lake Merritt, in Oakland, California, is Increased by This Double Settee over the Engine Pit

the engine pit. The sections may be moved easily if access to the engine is



By Moving the Benches Aside, It Is Possible to Make Repairs or Adjustments on the Motor That is Concealed beneath Them

desired. All boats are operated by the city, and it is estimated that they are used by 100,000 persons annually.

COMPOUND OF OIL AND RUBBER IS NEW WATERPROOF PAINT

A new paint compound being manufactured under patents in a western city is credited with a number of remarkable qualities. Being based on dissolved rubber and linseed oil, it forms a waterproof and flexible coating, and only one coat is needed. Used instead of oil in mixing paints, it covers one-fourth more surface, and takes only half the usual amount of pigment. Two interesting applications have already been made. On a Seattle bridge, 97 gal. were applied in 17 days, as against an estimate of 370 gal. and 34 days with common paint. Concrete grain-elevator pits which seeped water have been entirely dry since receiving a coat of the compound.

DESTROY CRANBERRY PESTS ON PACIFIC COAST

A successful fight has been waged by Pacific-coast cranberry growers against the black-headed fireworm, a destructive insect pest believed to have been taken across the continent on cuttings from eastern-coast marshes, and a record crop of the berries is expected this year as a result. In 1917, about one-third of the cranberry crop in that section of the country was destroyed by the worms, and last year approximately one-fourth. Cooperating with the growers, the Department of Agriculture has established an experimental station in the heart of the western cranberry-producing section, and maintains a corps of experts there for the study of local problems.

SELL EVERYTHING BUT DRUGS IN DRUGLESS DRUG STORE

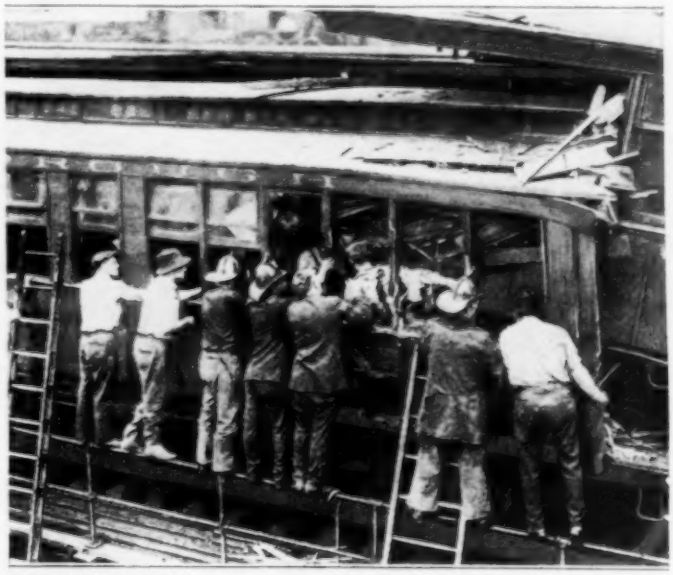
Subtraction being the order of the day in these times of fireless cookers, waiterless restaurants, and wireless telegraphy, a drug store, recently opened in a western city, is minus drugs. Almost everything sold in a modern drug store can be purchased in the drugless drug store, except the articles from which its name is derived. The stock includes perfumes, toilet

Drugs are Missing from the Stock of This Drugless Drug Store, but All Other Items Found in an Ordinary Shop of This Kind are Sold

articles, ice cream, cigars, stationery, magazines, cameras, and many other items.

COACHES TELESCOPE IN REAR-END COLLISION

Compared with the tremendous volume of traffic that streams endlessly, day and night, over the ever crowded elevated, surface, and subway lines of New York City the casualties seem almost negligible. Yet it is inevitable that occasionally a small gear in the great machine should slip, taking toll in human life. And such a mishap recently occurred when the brakes failed to work on a Third Avenue elevated train. A ghastly rear-end collision was the result. The two wooden coaches telescoped for a quarter of their length, crushing and mangling their human freight. Some victims were so securely pinned in the wreckage that the fire department was called to use ax and saw in the rescue work. Alone and helpless in his crowded little compartment, the motorman of the second train was the first to pay for the mad ride. Luckily none of the cars toppled off the elevated structure.



COPYRIGHT, KEYSTONE VIEW CO.

This Photograph was Taken Just a Few Minutes after the Rear End Collision of Two Wooden Elevated Trains in New York City. The Firemen have Already Chopped Away Enough Wreckage to Permit the Extrication of the Motorman's Broken Body

BIGGEST PIER IN ALL EAST TO BE BUILT AT MANILA

A new pier to be built at Manila, Philippine Islands, will be the largest, most completely equipped, and most modern structure of its kind in all the East. The sum of $700,000 has been appropriated for its construction and the installation of its machinery. When "Pier No. 7," as it is officially known, is completed, the present problem of unloading cargoes from foreign ships will be solved, and the congestion of shipments ended.

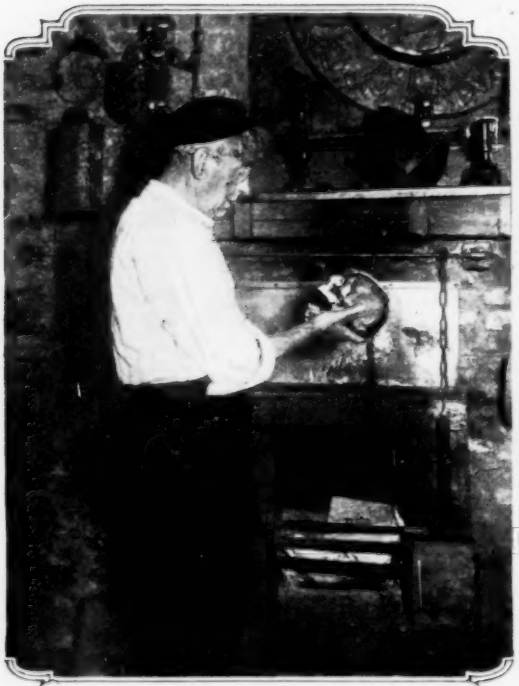
TOPOGRAPHER'S DUTY CARRIES HIM HIGH ABOVE CLOUDS

As they study the maps in guidebook or atlas, few persons realize that every line in every map was originally traced from nature, sometimes with the greatest difficulty and always with infinite care, by some expert topographer. Thus the map maker in the photograph has been compelled to climb, with instruments on his back, to the snowy summit of a western peak. Here, high above the clouds, he has set up his plane table, tying down the legs to save it from the clutches of the wind.

This Map Maker has Set Up His Plane Table on the Snowy Summit of a Western Peak after a Toilsome Climb through the Clouds with Instruments on His Back

HERMIT PAINTER FASHIONS HOME OF BEAUTY

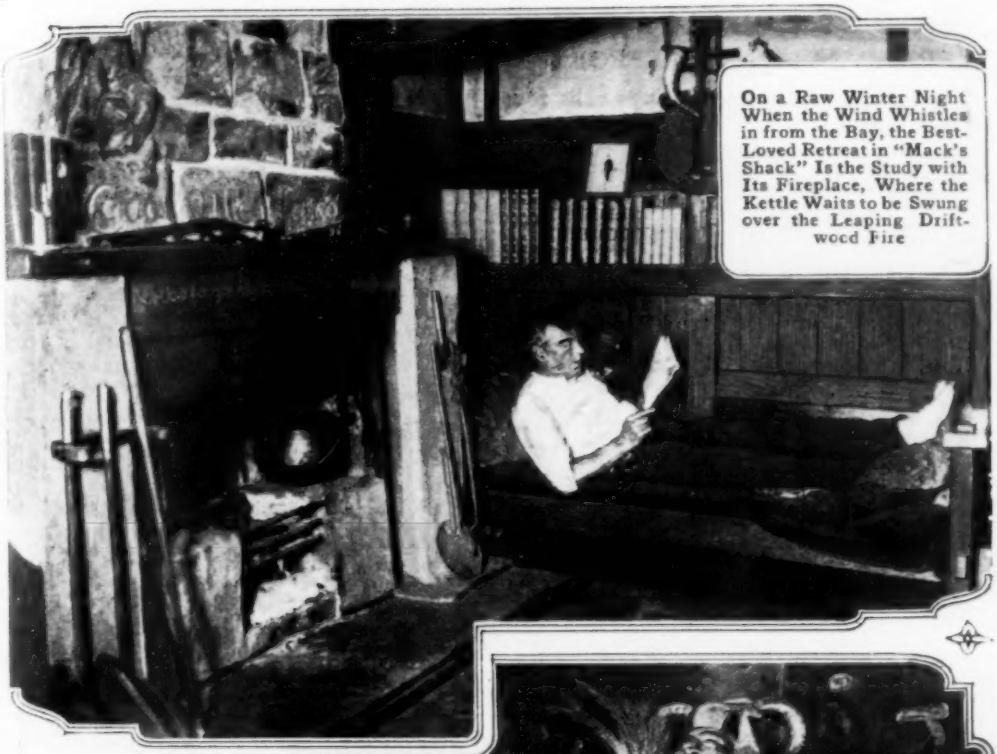
The Snuggest Little Home in All the Dunes Is "Mack's Shack," Which Braves the Loneliness of Sand and Wind on the Shores of Jamaica Bay, near New York City. Here the "Hermit Painter" Welcomes Friends from the City



A Tumble-Down, Weather-Beaten Cottage Greeted the Painter When He Arrived from the City, Scene of a Nervous Breakdown, and a Doctor's Warning to Flee from the Turmoil. "Mack" Brought with Him into His New Abode Some Baggage, Many Books and Paintbrushes, and an Unbounded Love of Beauty

The Old Cottage was Soon Transformed. Sea-Rusted Iron, Water-Rounded Stones and Bricks, Ships' Planks and Timbers, the Painter Found on the Shore and Used in the Work. An Old Galley Stove and a Nail Keg Sufficed for the Quaint Kitchen

AND COMFORT FROM DRIFTWOOD ON SEASHORE



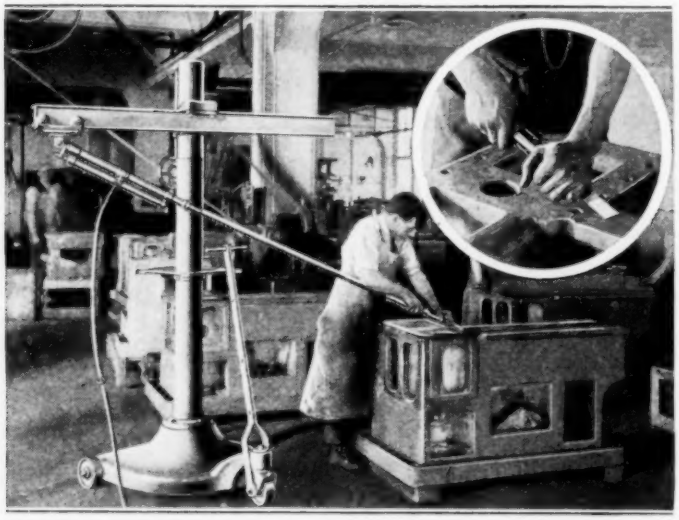
On a Raw Winter Night When the Wind Whistles in from the Bay, the Best-Loved Retreat in "Mack's Shack" Is the Study with Its Fireplace, Where the Kettle Waits to be Swung over the Leaping Driftwood Fire

The "Hermit Painter" has Built Two Fireplaces into His Study. Above This One are Ranged Bits of Driftwood, Carved and Polished like Old Egyptian Bas-Reliefs. Behind Them, and above the Wainscoting, the Painter has Reproduced an Egyptian Wall Painting

During the Eight Years in His Picturesque Little Home the Artist has Designed for Himself This Window of Leaded Glass. Having Designed It, He Painted It, Assembled It, and Set the Finished Product in Place

MACHINE SCRAPER FOR METAL RELIEVES MANUAL EFFORT

The scraping of metal castings calls for considerable skill, and the operation has seemed, by its nature, necessarily a manual one. An Illinois manufacturer, however, has now brought out a pneumatic machine which does the work in a manner reported to be entirely satisfactory. The scraping tool is fixed in a chuck on a long bar, at the other end of which is the working piston in its cylinder. The latter is held by a ball-and-socket joint on a small trolley traveling on a horizontal beam, which is supported by the vertical standard of the machine. The handgrip of the chuck controls the air, and an oil cylinder regulates the speed of the stroke. A novel feature is the automatic locking of the trolley to the beam at the moment of pressure. A turntable for the work is provided when the machine is stationary.



The Manner of Using the Metal-Scraping Machine is Indicated in the Insert. The Portable Type is Shown in the Large Picture and the Working Cylinder Is Just below the Left End of the Beam

CITY ERECTS HUGE MARKERS TO GUIDE AIR CRAFT

Pilots of air craft, bearing passengers and freight over the city of Elizabeth, N. J., will soon be guided by markers, bearing a letter and number which will identify the community as part of an official air route. After a conference among city officials it was announced that the markers, in either wood or concrete, and 30 ft. long, will be laid out in a city park.

SOUTH AFRICAN COAL MINES GROW IN IMPORTANCE

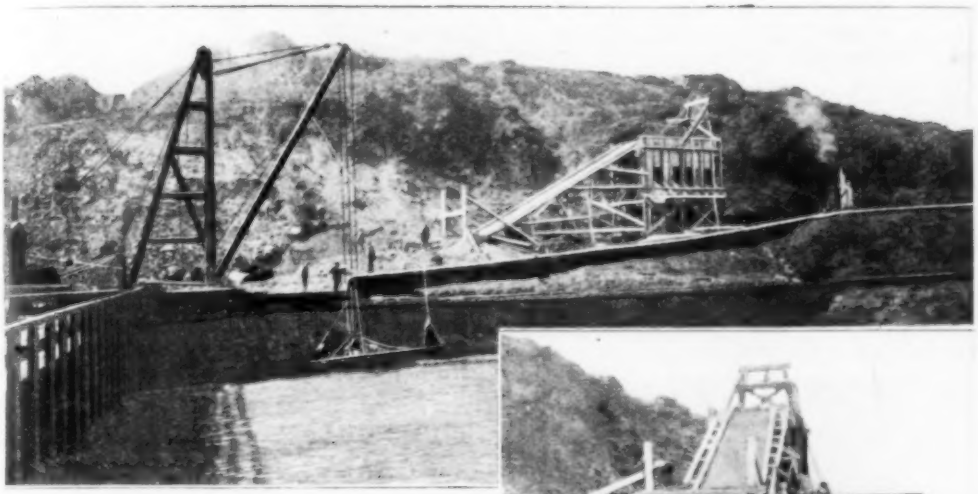
Coal mining has become one of the most important industries in South Africa, where an abundant supply of the fuel exists so close to the surface of the earth that its extraction is very inexpensive. As a result of the cheapness of coal, gold and diamond mines have greatly increased their output, and many new industries have been organized. During the last 10 years coal production in the district has practically doubled, and last year over 10,000,000 tons were mined, at an average cost of $1.72 per ton at the mine head. Of this quantity, 60 per cent was obtained in the Transvaal, 30 per cent in Natal, and the remainder in the Cape Province and the Orange Free State. While no statistics are available as to the exact amount of coal in the South African fields, these are known to cover an area of about 56,000 square miles. None of the deposits is more than 500 ft. below the surface. Various grades of fuel are found in different localities.

NEW PRODUCTION RECORD SET BY AMERICAN SHIPYARDS

Shipbuilding records are no sooner made than broken. American yards set a new production mark during the month of July, when 86 vessels were completed and delivered to the Emergency Fleet Corporation. One firm alone constructed 19 of these, while the remaining 67 were built in 35 other yards. Included in the output of the company which finished the highest number of ships were 10 fast torpedo-boat destroyers of the latest type, two large submarines, five tank steamers, and two seagoing tugs. To build this by no means small fleet required 78,000 tons of material, which could not be carried on fewer than 1,500 freight cars, or, in other words, a train approximately 18 miles long. If the 19 vessels were anchored end to end, they would form a line over one mile in length. The ships are modern in every respect.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

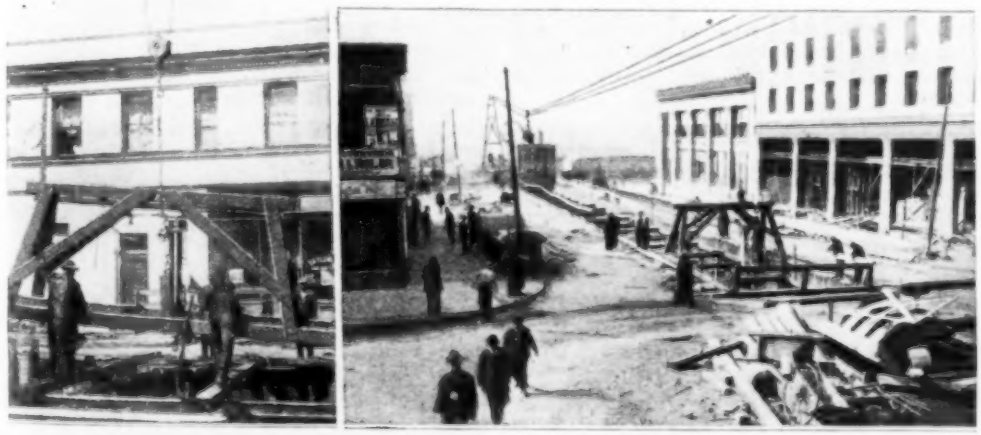
BUNKERS FOR EXCAVATING KEEP SHOVELS WORKING



Steam Shovels were Kept in Constant Service by These Bunkers, Which Held Excavated Material for the Wagons. This System was Employed by Contractors in a Western City

The Inclined Plane up Which the Shovels were Dragged for Dumping into the Bunkers, Located at Its Upper End

By using bunkers, from which material was dumped into wagons for hauling, two contractors of a western city found that they could keep their steam shovels steadily employed on excavating work, as this system obviated waiting for the arrival of a wagon to receive the load direct from the shovel. One contractor used an inclined plane, up which he dragged the loaded shovel by means of a steel cable. At the top of the incline the shovel was dumped into the bunkers below. The other con-

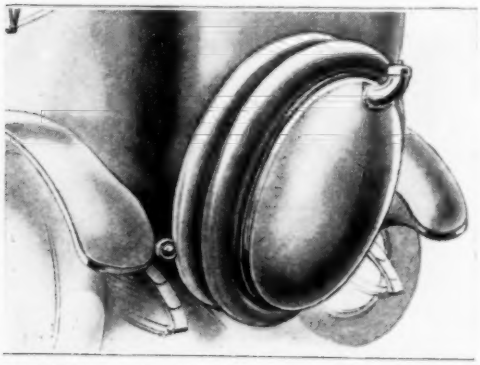


Digging a Trench in the Middle of a Street, Using Bunkers to Receive Excavated Material: A Cable Stretched between Two Towers Carried the Shovels. How a Steam Hammer was Moved with the Device is Shown in the Picture at the Left

tractor, who was engaged in digging a trench in the middle of a street, stretched a cable between two towers, located over a block apart, and on this moved the loaded shovel to the bunkers for dumping. It was possible to lower the shovel into the trench at any point from the overhead cable. Dump-bottom wagons were used by both contractors for hauling.

CYLINDRICAL GASOLINE TANK CARRIES SPARE TIRES

Two automobile accessories are combined in one by the recently patented invention of a Detroit man. These are a



Combined Gasoline Tank and Spare-Tire Carrier for Automobiles: Rims can be Slipped on the Cylindrical Container and Locked in Place

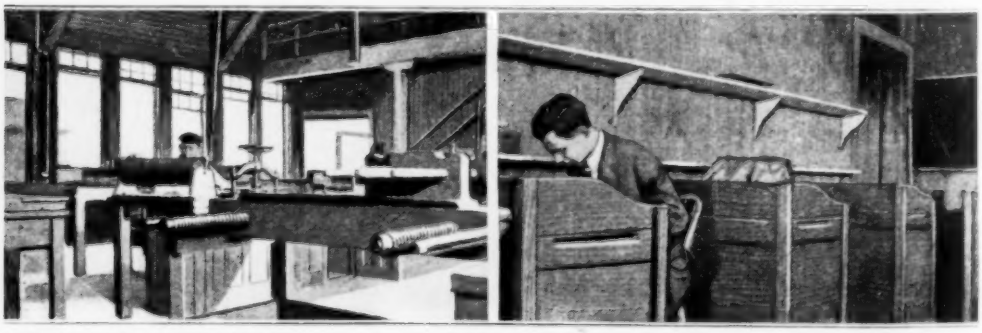
gasoline tank and a tire carrier. The tank is a steel drum, designed to be fastened at the rear of a car body in a tilting position. Recesses for two spare-tire rims are provided on the cylindrical container, and a special locking device holds them firmly in place when they are slipped on the tank. A curved filling pipe is placed in the rear head of the drum.

PLAN TO PUMP OUT MINES FLOODED BY GERMANS

Ten years must elapse before the coal mines around Lens, France, will be producing fuel at the pre-war rate, according to engineers who are in charge of plans for pumping out the water that was permitted to flood the shafts by the defeated Germans before the evacuation of the district by their troops in the fall of 1918. It is estimated that it will require 18 months to remove the water, which fills some of the mines to overflowing. Electrically operated pumps will be used. Current for the motors will come from a generating station not far from the scene of operations.

TUBERCULAR PATIENTS LEARN TRADES IN SANITARIUM

Patients discharged from a fresh-air tuberculosis sanitarium in the Adirondack Mountains leave the institution equipped with knowledge which enables them to earn a livelihood, as well as with bodies free from disease. Under the supervision of the medical staff of the health resort, convalescents are taught carpentry, basket weaving, picture-frame making, bookbinding, lace making, and photography, besides other trades, by skilled instructors. Like the other rooms in the building, the workshop in which the patients are taught is supplied with an abundance of fresh air through open windows, regardless of weather conditions. In order that work may be done in cold weather, some of the benches in the shop are provided with ducts underneath the top, through which hot air passes when the temperature is low, heating the surface so that the workers' hands are not numbed by the cold.



Fresh Air and Sunlight in Abundance are Admitted to a Workshop in an Adirondack Mountain Sanitarium, Where Patients are Taught Many Useful Trades. In Cold Weather Some of the Table Tops are Warmed by Hot-Air Ducts, Which can be Seen in the Picture at the Right

THE SNIPER'S BAG OF TRICKS

By REX HARROW

Ambushed in a Ruined House, the Sniper Never Took Up a Position at a Window, but Stationed Himself at the Far End of the Room, So That He could See without Being Seen

WITH the recent return to New York of a group of U. S. army "snipers," the detailed lessons in trickery and shooting magic, taught all allied sharpshooters in the great war, became known. Ingenious and scientific to a microscopic degree, they reveal how technical, and yet how fascinating, "sniping" became in the progress of warfare.

Without a doubt the most dangerous pursuit in the war, sharpshooting was the one branch of the service that Americans clamored with the greatest fervor to join, for it harked back to a traditional American superiority—the use of the rifle. Not even the generally credited statement that a sniper's life was, on an average, but 10 days, stopped them, and with the British and French they worked out an artful system of rules that completely baffled the Germans. Toward the last of the fighting, the American sharpshooters came to be called "body snatchers," on account of their success in this particular field.

The first rule for these daring riflemen who stole out in "No Man's Land" to pick off opponents, was that they should always hide "before" cover rather than behind it. By lying down between an object and the enemy a sniper was much more efficient than when lying with the protecting object between him and his prey. He was taught to blend himself with the house, tree, wall, or trench in his rear, open to the enemy's fire, but concealed from his sight. He was never to let his head appear against the sky line; never to shoot at a German head directly in front of him but always at heads far to the right or left. This mode of procedure prevented the Germans from discovering the angle from which the bullets were coming.

Every sniper carried a barometer and a little gauge for the measuring of the wind's velocity. He knew just how much the wind swerved the bullets at any and all velocities, and just how the amount of moisture in the air slowed the speed of a bullet.

One extremely important rule was that he should swab the muzzle of his rifle after every shot, to make sure that no moisture had collected there. One tiny drop of water would, upon the rifle's discharge, send up a puff of steam that would reveal him to his carefully watching enemies.

When shooting through a loophole in masonry, the sniper must water the aperture thoroughly so no dust would be blown into the air when the rifle spoke. In shooting from a house, the sniper never occupied a window, but stationed himself at the far end of the room where he could not be seen, and sent his bullets through the window from this distance.

He was never permitted, in the later days, to use binoculars, but was supplied with a telescope, for the use of the latter meant that the gleam of only one glass lens might be caught by the enemy, thus betraying the sniper, whereas with binoculars the chances were double. With this telescope he studied enemy trenches and "snipers' nests" all day long, scarcely moving, so keen was the enemy's lookout.

Snipers always worked in pairs, one using the telescope and the other the rifle, the former whispering directions to the latter. Lying a few feet apart, so that, if one was detected, the other need not necessarily be killed also, they lay all day long in one position, their only relief being the exchange of spyglass and rifle to lessen the intense strain.

Each pair of snipers made two sets of "nests" on nights before going out, establishing a false pair of "nests" where the enemy might discover them and placing near by the hiding places which they would actually occupy. Often from the

shrewdly camouflaged "nests" they could discover German snipers shooting at the dummy retreats and perhaps get a bullet into self-satisfied Heinie. If their nests were discovered, they took chances on wriggling out into shell holes, and thus away, but not until they had put up a little sign reading "Danger," which they always carried, so that no brother-sniper might occupy it later to his misfortune.

One of the most imperious rules was that no sniper who suspected the presence of an enemy sniper was to look directly at his adversary's hiding place. He was taught to move his eye all about the vital point—above, below, and to either side—but never squarely upon it. This was in obedience to the optical laws of man. The center of the eye fastened upon an object cannot detect action nearly so readily as can the outer sections of the eye. About the rim of the eye's pupil, action is caught quickly, and then the center of the eye automatically swings upon the object and focuses perfectly. For this obvious reason the sniper was drilled to observe this rule rigidly.

Snipers' rifles were always the pick of those furnished an entire division and were fitted with extremely complicated and accurate calibrated sights. Small telescopes, with scaled measures spaced upon them, gave the sniper the distance of an object while he sighted his weapon, and permitted him to tell within a few feet how far away his intended prey was stationed.

EX-SOLDIER'S PEANUT STAND DISGUISES SMALL AUTO

If it were not for the familiar hood, it would be difficult to identify the chassis of the mobile peanut stand, operated in a western city by an ex-soldier, as a common type of small motor vehicle. Extremely low wheels, fitted with solid tires, have replaced the regular wheels, and the relatively large body almost completely disguises the machine. Besides peanuts, ice cream and candy are sold by the proprietor of the stand, who finds juvenile customers at the parks and in other districts where children play.

PHOTO BY UNDERWOOD & UNDERWOOD

An Ex-Soldier's Peanut Stand is Carried on the Chassis of a Common Type of Small Automobile. The Little Wheels Lower the Counter so That It Is Convenient for Youthful Customers

NEW NAVY RIFLE RANGE IS LARGEST IN AMERICA

Equipped with 250 rifle targets, 20 pistol targets, all the necessary paraphernalia for small-bore matches, and a full complement of modern automatic clay-bird traps, the Caldwell Range just being completed by the U. S. Navy is the largest rifle range in the country. It is located four miles west of Caldwell, N. J., and is only 20 miles from New York City. The range is laid out on what was, until last year, a worthless stretch of marsh and timber swamp. Not only were the target butts and raised firing points completed in short order, but a number of frame buildings have been erected for the housing of the various appurtenances of a national match, ordinarily installed under canvas. The entire work of clearing and construction was done by the corps of navy range builders.

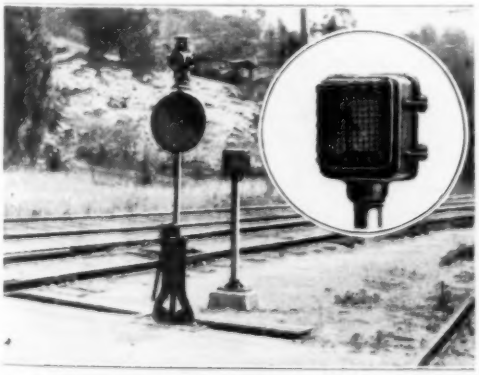
¶Steamships now sail directly from Mobile, Ala., to European ports, including London, Liverpool, Rotterdam, and Havre. The service was established recently by a company which operates vessels out of other cities on the Gulf of Mexico.

COOLS OIL WITH CONDENSER TO SAVE SHIP'S TURBINES

Running through seas whose temperature reached as high as 88°, the steamship "Anoka," on its way from Portland, Ore., to New York, recently found itself in trouble because of the overheating of its turbine bearings. The oil cooler proved inadequate, and the oil could not be reduced below 123° F., while the bearings reached 164°. In the emergency the ship's engineer conceived the idea of using the auxiliary condenser to cool the oil, and soon had it connected to the feed. By this ingenious method, the lubricant was reduced to 103°, and the journey finished without trouble. Boiling out the condenser with soda and kerosene soon restored its original condition.

SMALL SEMAPHORES PROTECT ELECTRIC RAILROAD CARS

In switching to the main line from tributary tracks, cars of an electric railroad in the West are protected from collisions by miniature semaphores located at all such junction points. These devices indicate the presence of a car on the main line, if it is near a switching point, by means of oscillating boards about 2 in. long, controlled by an electrically operated mechanism. The tiny signals are placed in metal boxes, and are protected with strong wire mesh. They are mounted on iron posts.



Miniature Semaphores, Inclosed in Metal Boxes, Guard against Collisions at Switches on a Western Electric Railroad

AIRPLANE PARTS DECORATE STRANGE DINING ROOM

A New York hotel is making a bid for the patronage of airmen and their friends by decorating a large dining room with

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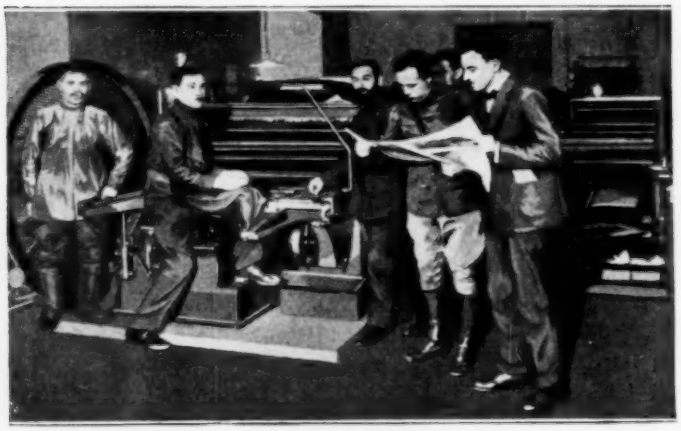
Around Various Airplane Parts and Insignia Centers the Decorative Scheme of This Hotel Dining Room. Ceiling Lights Glow within Glass "Bombs," as Shown in the Circle Above

replicas of airplane parts. In this effort to secure "atmosphere," the proprietors have covered the ceiling with varicolored allied insignia, interspersed with rudders and other airplane members. Illumination is furnished, in part, by glass reproductions of aerial bombs, each inclosing an electric bulb. Most novel of all, however, is the overhead electric fan which is nothing less than a four-bladed propeller projecting from a fuselage equipped with engine and machine gun.

¶Industrial statisticians make the statement that factories well lighted by ample windows show a relative increase of 12 per cent in production, and a decrease of 25 per cent in accidents and spoilage, besides a marked reduction in labor turnover. Where window space cannot be enlarged, a liberal use of white paint is recommended.

AMERICAN FORCES IN RUSSIA PUBLISHED OWN NEWSPAPER

As the American Expeditionary Force in France was unified and enheartened by the "Stars and Stripes," so the lonesome troops in northern Russia were served by their own newspaper, published at Archangel as the "American Sentinel." Since the facilities were extremely limited, much credit is due the officers and men whose efforts maintained the sheet. For a time the staff consisted of only three American soldiers, two of them convalescents, aided by two Russian girls and a native pressman.



The Army Captain and the Civilian Newspaperman are Examining an Issue of the "American Sentinel," Published at Archangel, Russia, for the American Troops in the Vicinity

TIRE SALESMANSHIP TAUGHT BY TRAVELING EXPERTS

Traveling instructors are employed by a large tire-manufacturing company to teach the managers of branch stores and the salesmen under their supervision the art of selling automobile accessories. A week is spent by the experts in each city where their services are required, the first three business days being occupied in investigating local conditions and needs, and the last three in classroom work. All parts of the country will be visited by the itinerant teachers.

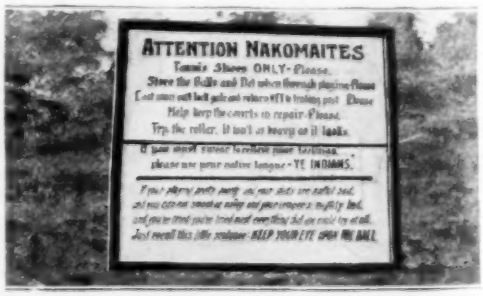
¶An alcohol fuel, recently tested by the Post Office Department, is to be used as a substitute for gasoline in the New York-Washington aerial mail service. The mileage per gallon is said to be about 25 per cent higher, with entire freedom from carbon.

BIG STEEL BRIDGE REMOVED AND SAVED FOR NEW USE

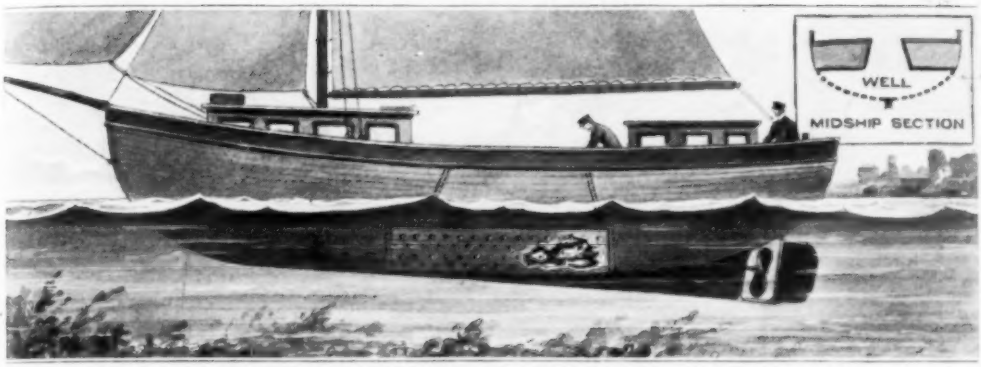
The work of wrecking a big steel bridge over the Missouri River a short time ago was so carefully done that the parts of the structure were uninjured, and only needed refitting to give good service at some other location. Framework strong enough to resist floods was built to support the 130-ft. trussed span until a derrick car on a spur track loaded its parts onto flat cars. The 353-ft. draw span was dismembered by a locomotive crane with 75-ft. booms, guy ropes preventing tipping as the span was thrown out of balance. All rivets that threatened to cause trouble were drilled out. The end girder span was withdrawn crosswise on tracks built on falsework for the purpose.

NOVEL SIGNBOARD APPEALS TO TENNIS PLAYERS

Poor sportsmanship is discouraged by a politely worded signboard near the courts of a Wisconsin tennis club. Besides requesting members of the organization to cooperate in keeping the grounds and equipment in condition, the painted notice suggests that players refrain from using profanity—at least, intelligible profanity—and presents a humorous verse intended to minimize display of bad temper. The signboard is declared to have succeeded in its mission, the results produced being satisfactory.


ATTENTION NAKOMAITES
Tennis Shoes ONLY-Please.
Help keep the courts in repair-Please.
Yep, the roller. It isn't as heavy as it looks.
please use your native tongue-YE INDIANS.

What Tennis Player could be a Poor Sportsman with This Signboard before Him? It was Erected near the Courts of a Wisconsin Club



Boat for Collecting Aquarium Specimens: The Illustration Shows the Well, Located Amidships, in Which the Live Fish and Marine Animals will be Transported, and a Cross Section Indicating the Width of the Well. A Motor and Sails are Provided for Propelling Purposes, and Cabins are Located Fore and Aft for the Accommodation of a Crew of Four Men

AQUARIUM COLLECTING BOAT HAS WELL FOR SPECIMENS

Aquarium specimens transported in the ordinary manner in shipping tanks often die after arriving at their destination as a result of the lack of proper conditions while in transit. To overcome this difficulty, a motorboat of special design has been built for the New York Aquarium, to be used for collecting fish and marine animals. Except for a well, located amidships, in which the living cargo is carried, the craft does not differ greatly from the common type of motorboat. It has a length of 35 ft., a beam of 11 ft., and draws 3 ft. of water. The well is 10 by 11 ft. at its bottom, and is supplied with water through holes bored in the hull. There is 2½ ft. of water in the well. Cabins are located fore and aft for the accommodation of four men. Besides a 25-hp. motor, the craft is equipped with sails for propelling purposes. Nets and traps are used by the crew to capture their quarry.

DISCOVERER OF SOUTH POLE NOW LOOKING FOR NORTH

Somewhere north of Taimur Peninsula, which juts into the Arctic from western Siberia, is the schooner "Maud," and on board is Roald Amundsen, discoverer of the South Pole, bent now on finding the other extremity of the earth's axis. The explorer sailed from Norway, and was last seen at Dixson Island in September, 1918. It is reported that his equipment included two airplanes, to one of which may fall the honor of covering the final lap of the arduous journey. It is his hope, however, to strike drift ice that will take him, perhaps, to his very objective. He has a wireless transmitter on board, but no receiver, because he did not want to be "bothered by news." Amundsen will collect all possible information as to soundings, drifts, and ice, and expects ultimately to come out at Alaska or Greenland, by way of Melville Island or Grant Land.

PARTS OF OLD AUTOMOBILES MAKE MOTORCYCLE CAR

By adding the tonneau seat of a dismantled automobile and the top of an unserviceable roadster to his motorcycle, an eastern man provided his machine with two comfortable passenger seats. The seat, with the top attached, was placed on springs over a crossbar fastened at the rear of the cycle and supported at each end by a rubber-tired wheel. Straps secured at one end to the front of the

An Eastern Man's Motorcycle Car, Made by Attaching to the Machine the Tonneau Seat of an Automobile and a Roadster Top

top, and at the other to a footboard under the seat, prevent the shelter from collapsing.

Part of the Course of the Roosevelt Tunnel through the Cripple Creek Gold Fields: Under Beacon Hill It Runs Down to a Half Mile, While "Raises" Tap the Shafts along Its Line. The Portal of the Tunnel is at beyond the Extreme Left of the Picture. The Photograph was

TUNNEL UNWATERS FAMOUS GOLD DISTRICT

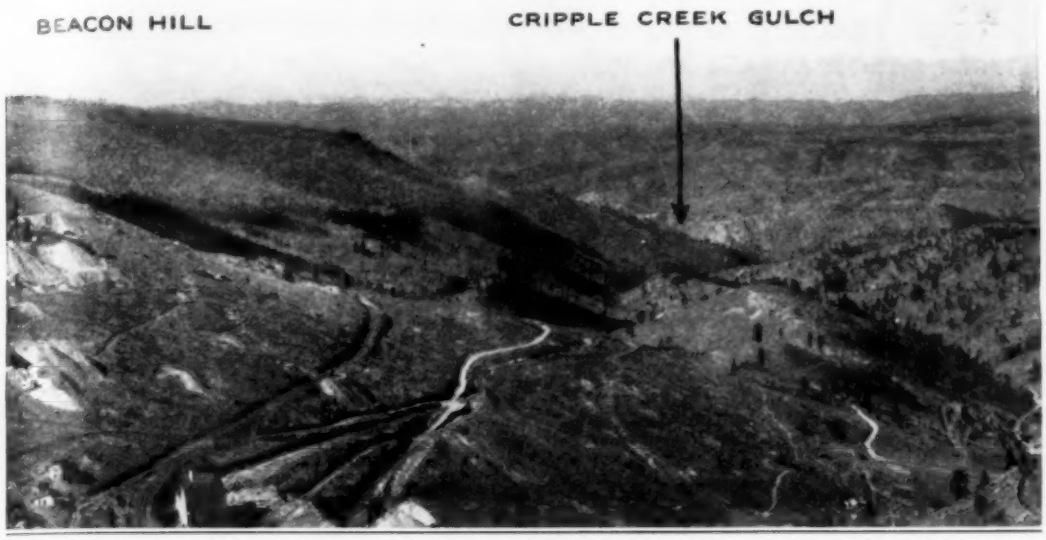
By J. E. MURPHY

DRIVEN for a distance of nearly five miles under the center of the Cripple Creek mining district of Colorado, the Roosevelt drainage tunnel has unwatered ore bodies lying deeper than the deepest workings in the district, and has furnished a permanent solution for what once seemed a hopeless drainage problem. More than ten years ago, owing to the enormous quantities of water encountered, the limit of development in the deepest shafts had apparently been reached. At that time several expensive attempts were made to lower the water level by pumping. After all attempts to unwater the district by this method had failed work was begun on the Roosevelt tunnel. The tunnel is now complete, and with its completion new life has been put into one of the greatest gold camps in the world.

Although designed to solve the drainage problem, the enterprise carried with it the romance of all such operations in the West. It was possible that any shot might uncover ore deposits of enormous wealth—and this, in fact, was what happened. Numerous valuable finds were made, the most important being a vein of rich ore, 30 ft. wide, under Battle Mountain. Another vein, intersected near Raven Hill, exceeds in value anything that has been found at higher levels. In fact, so important are the ore bodies discovered that there is now no question that the tunnel has created a new Cripple Creek at new low levels.

The tunnel averages from 8 to 10 ft. in width and 7 ft. high, and is 24,255 ft. long. Along one side is a trench, 3 ft. deep, designed to take care of the drainage after the first unwatering is completed. The portal is in Cripple Creek Gulch, five miles southwest of the town of Cripple Creek, and at an elevation of one and a half miles above sea level. The upper end, or "face," of the tunnel is under Battle Mountain, a mile north of Victor. Throughout its length the tunnel has a fall of 3 ft. in 1,000 ft. It has several important branches and is connected by "raises" with four of the principal shafts, the El Paso, Elkton, Cresson, and Portland. One branch connects with the Cresson shaft 2,000 ft. below the surface, while another, 2,000 ft. long, connects with one of the Portland shafts half a mile below the surface. If found necessary the tunnel may later be extended to the Golden Cycle shaft.

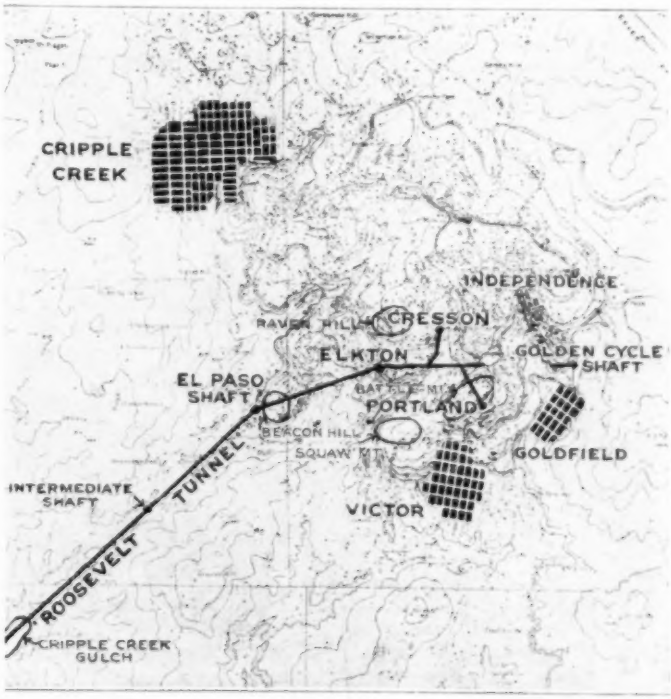
An idea of the work done by the tunnel is given by the daily records of water discharged from the portal. The maximum discharge occurred in 1916, when for three months the flow averaged 17,000 gal. per minute. By the end of 1918, this had declined to 2,500 gal. per minute, indicating that the mass of the water



2,000 Feet below the Surface, and Branches Connect It with the Cresson, Portland, and Other Shafts at Levels Cripple Creek Gulch, Indicated at the Right, a Mile and a Half above Sea Level, Its Upper End Being Taken Looking South, and Reverses the Locations on the Map

had been drained from the district. Calculations based on these records show that about 40,000,000,000 gal. of water has been discharged through the tunnel since the beginning of the construction work.

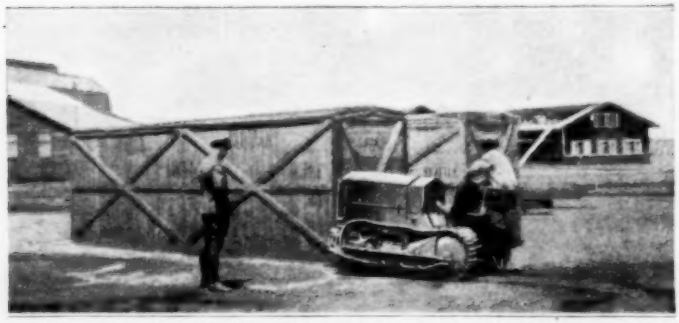
Plans for the big drainage project were laid as early as 1906, and construction actually started in 1907; but even at that time the El Paso drain was already in existence, having been completed in 1903. The function of this earlier bore was to unwater the western portion of the field. The El Paso tunnel, however, operated only to the 880-ft. level, and soon proved inadequate, though it greatly increased values at the time. The new work just completed cost practically $1,000,000, and the drainage problem has been solved once for all. Mining operations as deep as the tunnel will never again be seriously hampered by water. Shafts sunk deeper than this will no doubt encounter water in large quantities, but this will have to be pumped only to the tunnel level, an inconsiderable task compared with the additional lift of a sheer half mile that would be necessary if only surface drainage was available.



Course of the Tunnel through the Field, from Its Upper End at Battle Mountain to Its Portal at Cripple Creek Gulch, Indicating Branches and Shaft Connections: The Bore may be Extended Later to the Golden Cycle Shaft

MIDGET TRACTOR SAVES TIME AND LABOR AT AIR STATION

A small endless-tread tractor has come to be one of the most valued bits of equipment used about a large naval air station. Thus, while the task of moving a boxed seaplane from flat car to warehouse formerly kept 40 men busy for an hour and a half, with the little tractor at work the big boxes are dragged off the cars and hustled into the shops in 15 minutes. Powered with a 60-hp. engine and geared low for just such work, the machine moves a load of five tons with ease.



This Powerful Little Endless-Tread Tractor Pulls the Boxed Seaplane off the Flat Car and Pushes It into the Warehouse in 15 Minutes. Forty Men Formerly Required an Hour and a Half for the Same Job

ELECTRIC SMELTERS PLANNED FOR DUTCH EAST INDIES

Hydroelectric plants may be built in Celebes, an island in the Dutch East Indies, to furnish current for electric smelters planned to handle the iron ore recently discovered there in large quantities. The use of coke is being considered, but is not as favorably regarded as electricity generated by water power. Preliminary surveys of the deposits indicate that there are 5,000,000 tons of surface ore and 155,000,000 tons of clay ore available, with the possibility that there are 7,000,000 tons of the former and 206,000,000 tons of the latter, a total of 213,000,000 tons. All of the ore is within 45 ft. of the surface, and can be removed without great cost, if it is found practical to harness some of the numerous streams on the island.

AMERICAN SUBMARINE SINKS AND DROWNS THREE

The sinking, suddenly and without warning, of the American submarine "G-2," with its crew of nine men, off Waterford, Conn., recently, adds another to the navy's list of mysteries. Three of the crew were lost, the rest being saved by a coast-guard cutter. Observers stated that the floating ship, which was of an obsolete type launched in 1912 and was being used in depth-bomb experiments, went down stern first, lifting its bow 10 ft. in the air. The sinking occurred just after the officers and men had boarded it, and it is thought that the hatches may have been left open.

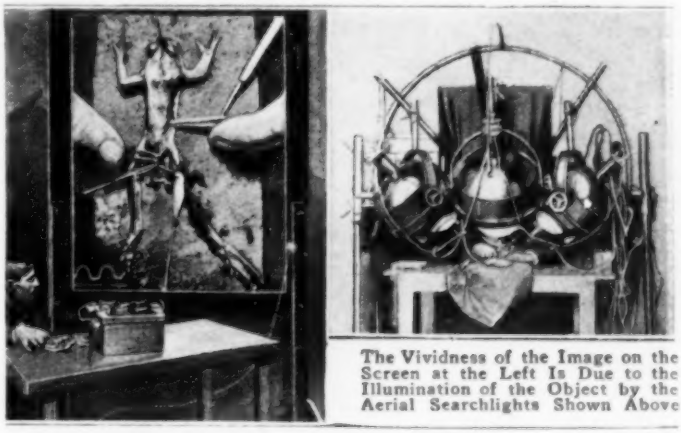
HORSES STILL IN SERVICE IN NATION'S CAPITAL

In these days of transatlantic aeroplane flights, automobiles, and other swift features of modern transportation, a horse-drawn vehicle for the conveyance of passengers is something to make the average person look twice. There are few hacks and cabs operating in the larger cities of the United States, but in Washington, D. C., it is not uncommon to see dozens of carriages, cabs, and hacks, drawn up at a railway station, waiting for passengers, in competition with the gasoline-propelled taxicabs. Sight-seers quite frequently choose the slower vehicles for a leisurely tour of the nation's capital.

The Colored Man Driving This Cab Declares That He has been a Coachman in Washington for the Last 40 Years. He Declines to Give the Age of the Horse He Drives

DISSECTION WORK PROJECTED WITH AERIAL SEARCHLIGHT

An improved apparatus for projecting dissection work upon the screen has been installed in one of the large classrooms of a famous French university at Paris. The rat, frog, or similar animal to be experimented on, is pinned on a table between the hands of the demonstrator. A foot and a half above the table is an object glass surmounted by a large reflecting prism which projects a picture of the operation on the screen, permitting every member of the class to follow it in all its details. The lighting system is the novel feature of the installation. Three great anti-aircraft searchlights, of 5,000 cp. each, throw a brilliant light on the subject. It has been found that they radiate far less heat and give a more satisfactory light than the electric arcs usually employed for this purpose.



The Vividness of the Image on the Screen at the Left Is Due to the Illumination of the Object by the Aerial Searchlights Shown Above

BERMUDA-NEW YORK RECORD BROKEN BY SUB CHASER

In spite of unfavorable weather, a new motorboat record for the trip between Bermuda and New York City was established by the submarine chaser "SC-131," winner of the recent island-to-metropolis race participated in by six gasoline-propelled vessels of that classification. The official time of the "SC-131" was 57 hr. 20 min., which is considerably less than the former record, 88 hr., made by the motorboat "Dream" in 1918. Two other chasers, the "SC-217" and the "SC-351," finished the race within an hour after the winner, but the remaining three came in several hours later than the leaders. All of the boats were on duty in the Mediterranean Sea during the war, and each cruised more than 20,000 miles in the eastern waters. The winning craft is 110 ft. in length.

These Patient Colombian Shipbuilders are Hewing Their River Craft from a Single Giant Trunk. The Job Requires Months of Toil with Adz and Chisel

PRIMITIVE SHIPYARDS FOUND IN COLOMBIA

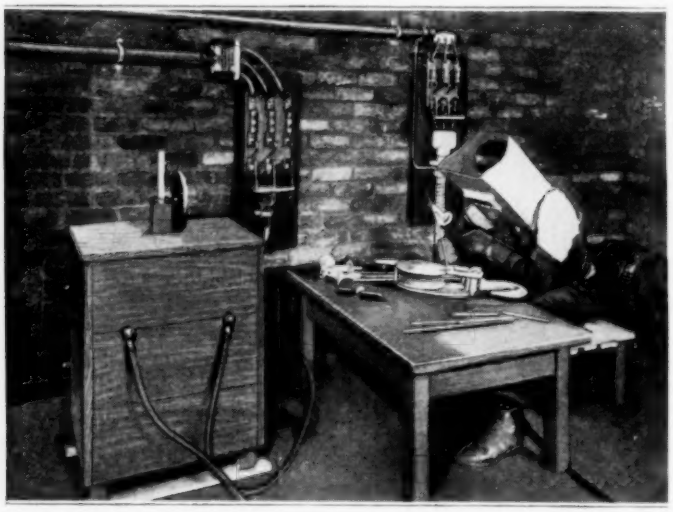
The natives in the interior of Colombia, South America, still use the picturesque dugout, carved from a single log, to convey their bananas and other produce to market. Four workers are shown in the illustration busy on a typical 18-ft. canoe which has not been moved since it was felled at the river bank. Such construction is necessarily slow, involving months of constant toil with adz, maul, and chisel. When finished, the craft will be owned by three partners who will also be the crew, two working at the paddles while the third uses a long pole in the rear.

¶ Reports on road conditions are being included in the weather bulletins for some states issued by the U. S. Department of Agriculture, and the new service is to be extended as rapidly as possible.

Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

MOVABLE TRANSFORMER COIL REGULATES WELDING SET

In a new electric arc-welding set, the arc is made adaptable to various classes of work by means of an adjustable transformer. The secondary coil is attached to a vertical rod which extends through a bushing in the top of the case. A rack cut on the rod engages a pinion on a handwheel shaft, and by turning the latter the relations of the primary and secondary coils are changed to suit the amount of current required for the job in hand, the arc electrodes being changed to correspond. The transformer is of sectional-unit construction, and may be enlarged as the demands upon it increase.



By Turning the Handwheel on the Transformer Case at the Left, the Secondary Coil is Shifted in Its Relation to the Primary, Adjusting the Current to the Needs of the Welding Arc That the Operator at the Right is Using

PRODUCT OF DOMESTIC TREE RESEMBLES ORIENTAL GUM

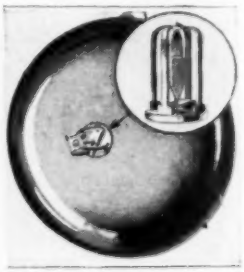
Laboratory experiments are being conducted by the Forest Service to determine to what extent a honeylike substance obtained from the red-gum tree, common in the South, can be utilized as a substitute for storax, a somewhat similar material imported from far-eastern countries, and used in the manufacture of perfumes, court-plaster, and other articles. Interest in the subject was aroused as a result of the war, which curtailed the importation of the foreign product. A considerable quantity of the domestic gum has been gathered and sold for $2 a pound.

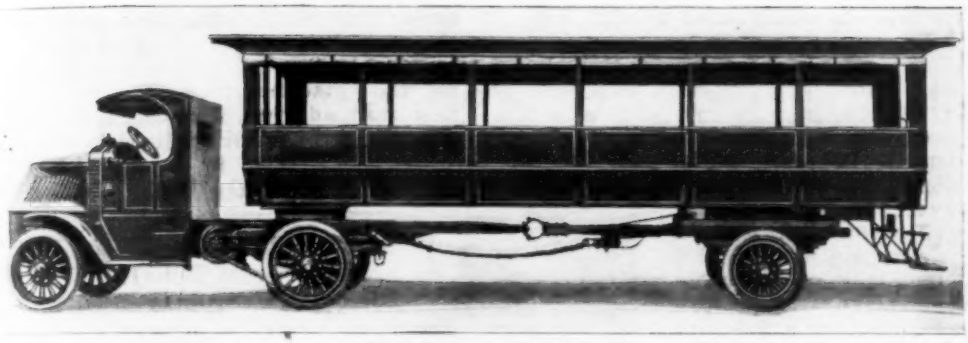
DISTANT TEMPERATURES READ BY ELECTRIC THERMOMETER

Temperatures at different points about a plant are indicated or recorded at the office or other central location, by means of a new electrical thermometer. The range of the instrument is very wide, extending from 328° F. below zero to 1,004° above. The thermometer element is a coil of platinum wire on a porcelain spool, about 2 in. long and 7/16 in. in diameter, covered with a glaze and protected by a metal sheath. This coil is connected as one arm of a Wheatstone bridge, whose three remaining arms are unaffected by temperature changes. The galvanometer of the bridge is mounted on the central switchboard, and may be calibrated at any time by substituting, with a test plug, a standard resistance for the platinum coil. For permanent records, the galvanometer is connected to an instrument whose needle is depressed at intervals, making ink dots on a moving thread.

FUSE CONTROLS MECHANISM OF NEW FIRE ALARM

Controlled by a metal fuse which melts at 165° F., a new fire alarm is operated by a spring-actuated mechanism incased in a gong. The device is intended for homes, but can be used in stores or factories. It is installed on the wall near the ceiling. In case of fire, the fuse melts, releasing the catch which locks the ringing movement. The bell rings five minutes before the spring is unwound. To reset the alarm, it is necessary only to replace the melted fuse with a new one, and to wind the spring by turning the gong. The contrivance is sold at a low price.





Employes of an Oil Company in a Southern State Ride to and from Work in This Huge Trailing Bus, Which Has a Seating Capacity of 80 Persons. The Body Is 25 Feet Long, Eight Feet Wide, and Six Feet High. Inside Are Four Longitudinal Benches

BIG TRAILING BUS CARRIES EIGHTY PASSENGERS

Eighty passengers can be seated in an enormous truck-trailer body used by an oil company in a southern state for conveying employes to and from their work. The bus is 25 ft. long, 8 ft. wide, and 6 ft. high. It has four longitudinal benches. Steps at the rear facilitate loading and unloading. The sides are fitted with roller curtains. A fifth wheel, or turntable, near the rear of the truck, which has a very short wheelbase, bears the weight of the front portion of the trailer. Through an extension rod from the truck, and another from the axle of the trailer, connected by a universal joint, the wheels under the rear of the body are turned in the same manner as the front wheels of a wagon, and track with the rear wheels of the truck. This allows short turns to be made. Two chains, fastened to the sides of the truck frame and connected with a singletree on the extension pole of the trailer axle, bear the pulling strain.

HEAVY AUTOMOBILE TRAFFIC ON LINCOLN HIGHWAY

Automobile traffic on the Lincoln Highway is considered to be heaviest in the vicinity of Jersey City, N. J., where recently 11,000 motor vehicles on the transcontinental road crossed a bridge over the Passaic River, west of the city, in 14 hours. Of this number 10,610 were passenger cars, and 390 trucks. The figures mean that more than 780 machines passed over the structure every hour, and that the average was over 13 for each minute of the period. Only 65 horse-drawn vehicles used the bridge while the count was made.

LUMBERMEN USE AIR MOTORS FOR ROTATING AUGERS

Pneumatic motors have been adopted by the lumbermen of the Northwest, who equip them with long augers for boring holes in the enormous logs that are used in making donkey-engine sleds. Two men are required to handle each machine, which penetrates the wood to which it is applied with remarkable rapidity. Because of this labor-saving device, ten sleds can be constructed in the same time required to complete one by the old hand-tool method.

Boring Holes with an Air Motor: The Machine is Driving an Auger through One of the Big Logs Used in Building Donkey-Engine Sleds

¶ Pineapple growing has become an American industry of sufficient importance to have a growers' association, which has just been organized in St. Lucie County, Florida.

USEFUL ARTICLES COMBINED IN CARVED FURNITURE

An ordinary pocketknife was used by an eastern man to carve an elaborate piece of furniture which comprises several useful articles. It required over a year to complete the work, which was done during spare moments. Pyramidally placed on a player-piano music-roll cabinet are a fireproof safe, an eight-day clock, a music box, and a miniature Statue of Liberty. Each section can be used separately. Inclosed in the base of the statue is a battery which furnishes current for lighting bulbs on the four posts at the corners of the base, and in the upraised hand of the figure. The ensemble is 8 ft. 6 in. high, and is finished to resemble mahogany.

Using His Spare Time for Over a Year and Working with an Ordinary Pocketknife, an Eastern Man Produced This Elaborately Carved Piece of Furniture

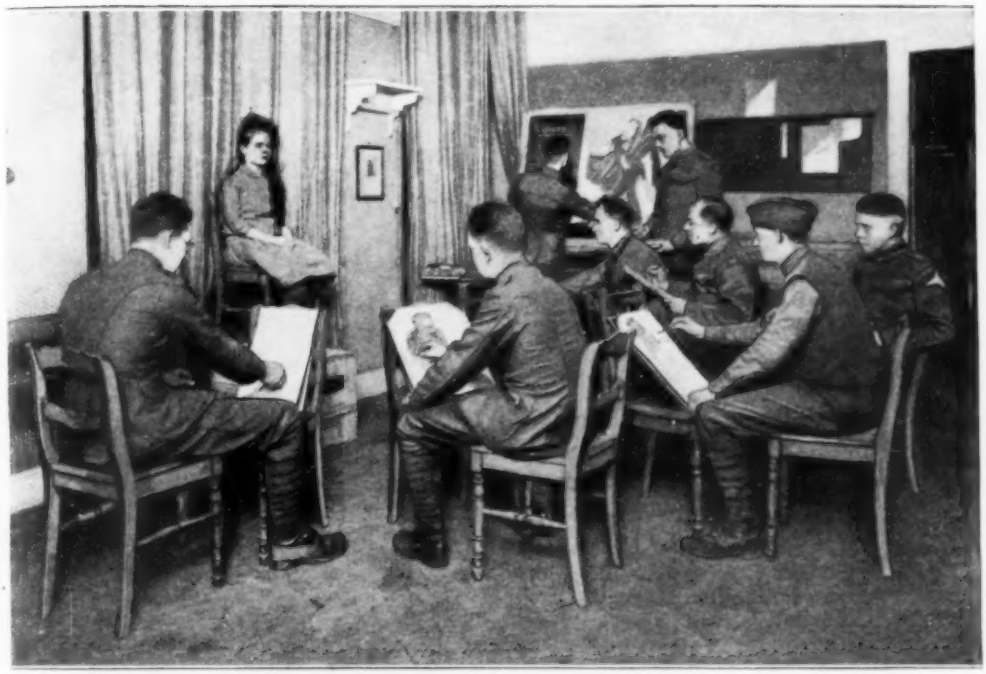
AUTOMOBILE USED AS LOCOMOTIVE FOR LABORERS' TRAIN

Fifty laborers were transported to and from their work on a novel train during the construction of a 70-mile railroad line, recently completed between Laurel and Rapelje, Mont. Flanged wheels were procured and fitted on a powerful automobile, which was placed on the rails, and the machine served as a locomotive. Six small, four-wheeled flat cars were used, the men sitting or standing on these. A reasonably fast schedule was maintained by the gasoline-propelled train. The new railroad runs through a rich dry-farming district, which will be greatly benefited by the line.

ENORMOUS HARBOR IS PROJECTED AT ITALIAN SEAPORT

Famous now as the birthplace of Columbus, picturesque Genoa, Italy, is destined to become noted for the completeness and size of its harbor facilities. Plans have been made for the improvement and enlargement of the port, to cost nearly $58,000,000, and to require 20 years for completion. Extensive jetties and quays will be constructed; railroad lines will be built to facilitate the loading and unloading of ships; great warehouses will be erected, and large areas near the water front will be set aside for industrial plants. The latter provision will make possible the shipment by water of manufactured products without long hauls between factory and seaport. One of the basins to be improved, when completed, will have a water surface that will measure more than 247 acres, and will be inclosed by nearly 6,000 yd. of shore walls.

Automobile-Drawn Laborers' Train on a Recently Completed Montana Railroad: Fifty Men Rode on the Six Small Flat Cars Attached to the Motor Vehicle, Which was Fitted with Flanged Wheels. Fast Time was Made by the Gasoline-Propelled Train



American Soldiers Studying Art in a Public-School Building in Coblenz, Germany: Their Model Is a Little German Girl. Lacking Easels, the Men Use Chairs to Hold Their Canvases and Drawing Paper

AMERICAN SOLDIERS UTILIZE GERMAN SCHOOL BUILDING

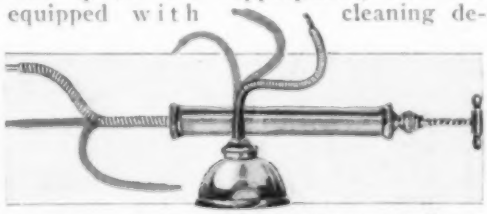
Deserted by pedagogues and pupils of Teutonic birth, a large public-school building in Coblenz, Germany, is used by American soldiers for the study of art, history, mathematics, mechanical drawing, and other subjects. Instruction in free-hand drawing and painting is given five nights in each week. Some members of the nocturnal art classes have made plans to take more advanced courses later in Paris and elsewhere. Many of the posters used by the army in the occupied zone are the work of these soldier-students.

TRADE USE OF WORD "ANZAC" IS BARRED BY REQUEST

Use of the term "Anzac" by manufacturers and dealers as a trade name has been interdicted by Great Britain and all its colonies, and a few American concerns which had adopted the word have been requested by the Australian commission in the United States to discontinue its use. As is well known, the word is formed from the initials of the Australian and New Zealand Army Corps. The wonderful deeds of that organization in the war have given the coined name an almost sacred significance to its native lands, where the thought of commercializing it is extremely distasteful.

FLEXIBLE OILCAN SPOUTS BEND TO ANY SHAPE

Flexible steel spouts for oilcans and grease guns are recent innovations. With these it is easy to apply lubricant to bearings that are difficult to reach with the ordinary devices used for this purpose, as they can be bent into any shape desired. The spouts are copperplated, and are equipped with cleaning devices which remove particles that interfere with the flow of oil or grease. They are especially useful on automobiles.

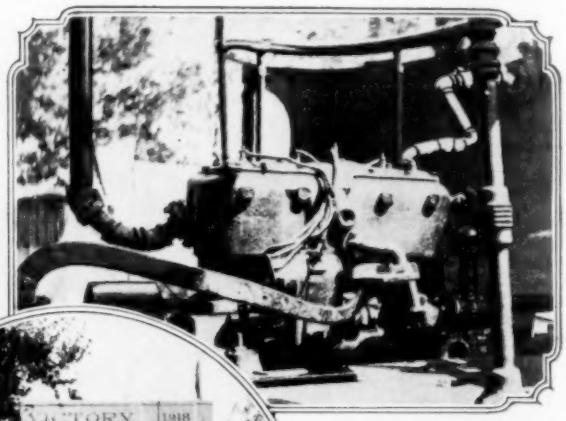


Grease Gun and Oilcan Fitted with Flexible Spout: Bearings Ordinarily Hard to Reach can be Lubricated with These Devices

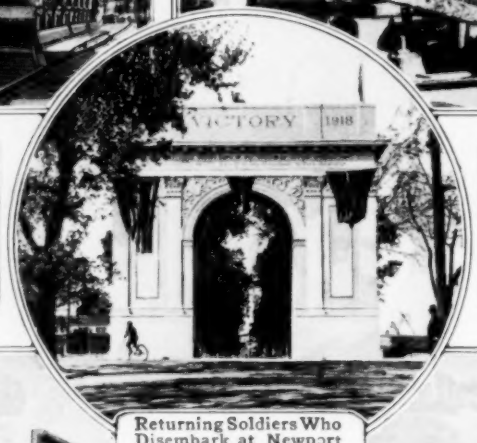
Popular Mechanics features will appear in moving pictures issued by Paramount Magazine.

CIVIC FEATURES THAT PROMOTE THE COMFORT

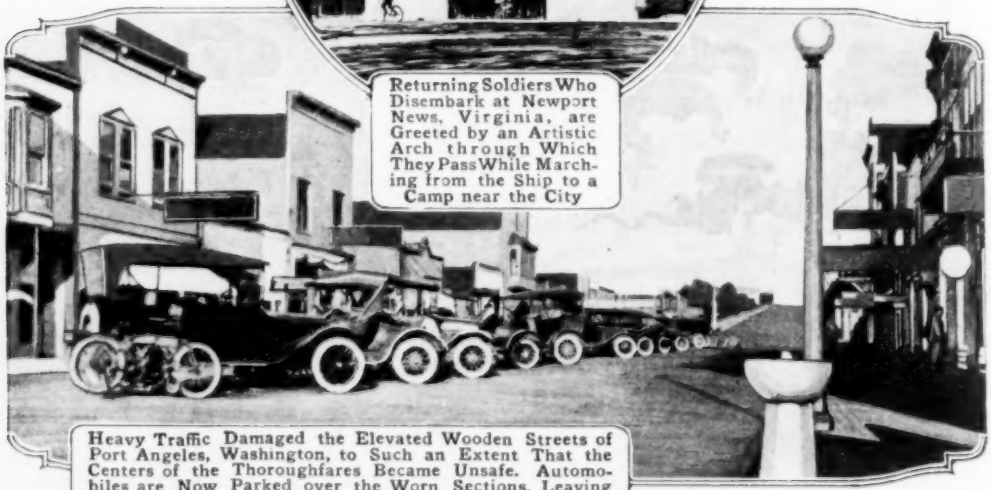
Propelled by an Automobile Motor, This Old Street-Car Trailer Makes Three Round Trips Daily between the Railroad Station at Lakewood, Michigan, and a Summer Resort on a Lake, Five Miles Away



This Gasoline Engine is Geared to the Front Truck of the Trailer. At the Left of the Picture Is the Exhaust Pipe, Which Extends through the Roof. The Radiator is Fastened in Front



Returning Soldiers Who Disembark at Newport News, Virginia, are Greeted by an Artistic Arch through Which They Pass While Marching from the Ship to a Camp near the City

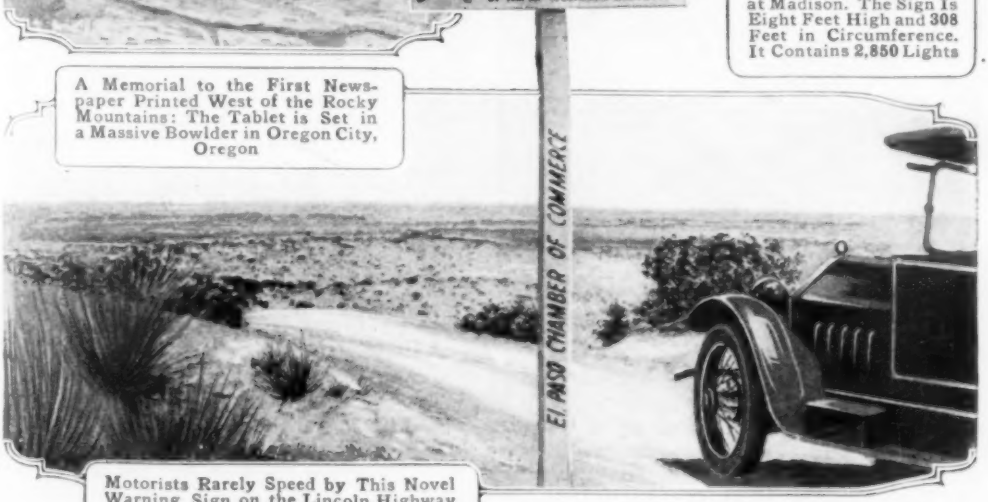


Heavy Traffic Damaged the Elevated Wooden Streets of Port Angeles, Washington, to Such an Extent That the Centers of the Thoroughfares Became Unsafe. Automobiles are Now Parked over the Worn Sections, Leaving the Unworn Sides for Moving Vehicles. Piling Supports the Streets over Tide Flats

Pedestrians Avoid a Dangerous Railroad Crossing in Los Angeles, California, by Walking under the Tracks through a Tunnel, Which is Reached by a Sloping Sidewalk. The Floor of the Tunnel Is About 10 Feet below the Level of the Rails

A Memorial to the First Newspaper Printed West of the Rocky Mountains: The Tablet is Set in a Massive Bowlder in Oregon City, Oregon

Wisconsin Shows Its Appreciation of the War Services of Its Citizens by a Huge Electric Welcoming Sign Encircling the Dome of the Capitol at Madison. The Sign Is Eight Feet High and 308 Feet in Circumference. It Contains 2,850 Lights

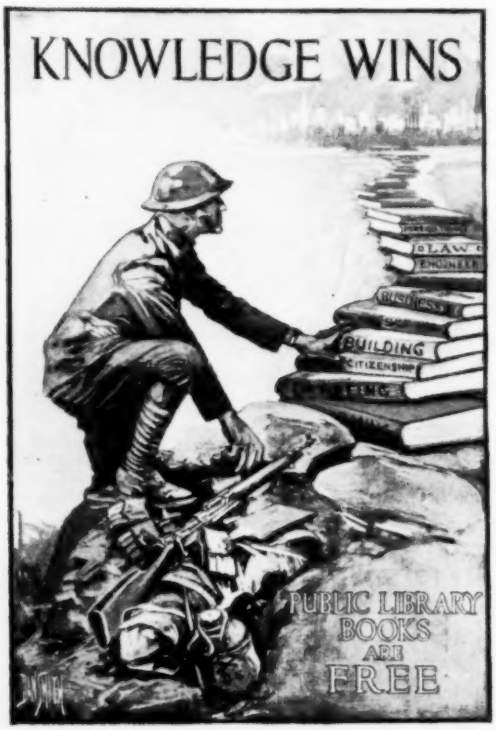


Motorists Rarely Speed by This Novel Warning Sign on the Lincoln Highway near the Texas-New Mexico Border. The Skull and Crossbones, Combined with the Reference to a Cemetery, Speaks Plainly of the Dangerous Hill Ahead

In a Public Park at Pasadena, California, Picnic Parties may Rent Lockers in Which to Leave Lunch Baskets, Coats, and Other Articles. Padlocks Guard the Contents of the Boxes, Which are Made of Heavy Galvanized Netting. A Roof of Palm Leaves Shelters the Novel Convenience

VOCATIONAL-TRAINING BOOKS FOR EX-SERVICE MEN

In cases where public libraries are not available, books are to be lent to discharged soldiers, sailors, and marines by the American Library Association, which provided reading matter to service men in home camps and overseas during the war. Volumes will be sent anywhere by the organization upon the receipt of requests. Special efforts are being made to increase the demand for works on vocational subjects. As part of the campaign to this end, posters are being distributed throughout the country. One, which makes a powerful appeal, is called "Knowledge Wins." It depicts a soldier, fully equipped, climbing out of a trench on a stairway of books that leads to a city of tall buildings and busy factories, typifying success.



With This Poster the American Library Association is Endeavoring to Increase the Demand for Books among Ex-Service Men

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¶ Tanned goat skin, the "kid" of the shoe trade, is bringing around $1 a square foot, which weighs about four-fifths of an ounce. Waste in cutting brings the value per ounce up to $1.50, or so. Silver bullion still sells at $1.07 an ounce.

OIL-SOAKED SAWDUST KILLS LARVÆ OF MOSQUITOES

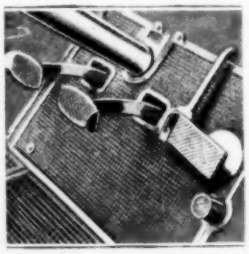
Oil-soaked sawdust destroys the larvæ of mosquitoes if scattered broadcast over inundated rice fields, but does not harm the grain crop, according to a bulletin issued recently by the United States Public Health Service. In an experiment conducted on an Arkansas farm, about three gallons of fuel oil was used for each bushel of sawdust, and two treatments destroyed all larvæ in one field. A thin film of oil is spread uniformly over the surface of the water by this method. Drip cans were tested, but found unsatisfactory because of the uneven distribution of oil, which damaged the growing rice.

MOVIE FILMS OF POTATOES SHOW "LEAK" DISEASE

Motion pictures of diseased potatoes have just been prepared by the U. S. Department of Agriculture for the benefit of growers, particularly in California, who are having trouble with so-called "leaky" tubers. The films show the progress of the malady from the infection, when the vegetable is wounded by hoe or fork, or by breaking off one of its "knobs," until it becomes a soft, spongy, decayed mass. The pest is of the fungus variety, and very active in attacking injured potatoes.

ALUMINUM PEDAL OPERATES AUTO FOOT THROTTLE

Fatigue resulting from manipulating the ordinary foot throttle of an automobile is made a thing of the past by a new contrivance, according to its manufacturers. This is an aluminum pedal, pivoted near one of its ends on a base intended to be fastened to the floor alongside the regulation type of accelerator so that one end of the pedal bears lightly on the foot lever. To operate the device, the foot of the driver is rocked from side to side, while resting comfortably on the pedal. Corrugations on the surface of the pedal, and a guard at one end, prevent the foot from slipping.



POLICE WILL INDEX CRIMES ON SPECIAL CARDS

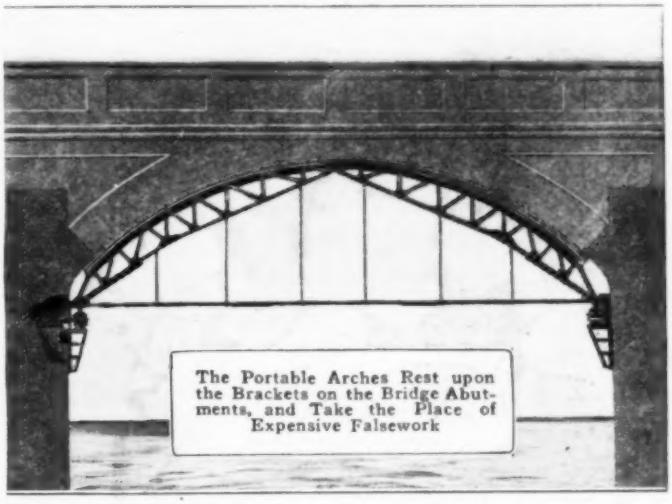
Crimes will be indexed according to their outstanding features by the police department of New Orleans on cards provided especially for that purpose, and search for the perpetrator of a certain misdeed will be narrowed down to seeking for criminals whose characteristic methods are described by the record of that particular illegal act. This system is based on the generally accepted theory of criminologists that each criminal has a peculiar way of committing a burglary, robbery, or other crime. Each serious violation of the law will be indexed thoroughly. A complete description of the crime itself will be given in each case, including the location and the hour it was committed, while the demeanor of the criminal will be recorded, as well as other details bearing on the matter. The southern city will be the first in this country to test the system, it is stated.

BATHTUB FIXTURE COMBINES SUPPLY AND OVERFLOW

A bathtub fixture recently placed on the market provides for the admission of hot and cold-water supply pipes and an overflow drain pipe through a single hole in the end of a tub. The water-supply pipes enter the overflow pipe from either side of the elbow joint at its upper end. Inside they are bent to extend through the center of the drain pipe to the combination faucet, to which they are connected. Another feature of the fixture is an expanding metal washer which is used at the connection of the bottom drain with the tub.

PORTABLE ARCHES SIMPLIFY CONCRETE BRIDGE MAKING

The elaborate scaffolding and falsework hitherto necessary for building concrete bridge arches is wholly eliminated by a patented method used by an eastern steel concern. The bridge piers and abutments are first completed, with brackets seated upon their sides. Portable arches of steel, hinged at the center, are then lowered by derricks into position between the brackets. On these the forms are erected, reinforcing installed, and the concrete poured. When it has set, the steel arches are lowered into barges, by winches operated on the completed bridge span, and moved to the next span, or another job. The hinge allows some latitude in the length of span one set of temporary arches can handle, by slightly changing the form of the opening.

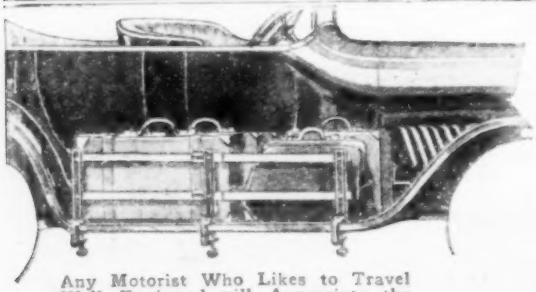


The Portable Arches Rest upon the Brackets on the Bridge Abutments, and Take the Place of Expensive Falsework

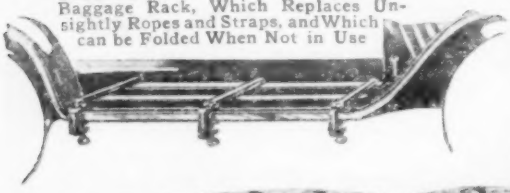
USE MODEL GRAIN ELEVATOR TO SHOW FIRE DANGER

How destructive fires are started by dust explosions was demonstrated recently to 300 boy scouts at Spokane, Wash., by means of a miniature grain elevator, with which such a disaster was staged on a small scale. The fire-prevention committee of the local chamber of commerce had charge of the exhibition, which was given with the idea of impressing upon the youths the danger of untidy buildings, and to instruct them in methods for reducing the danger of conflagrations. Further instruction was given with moving pictures.

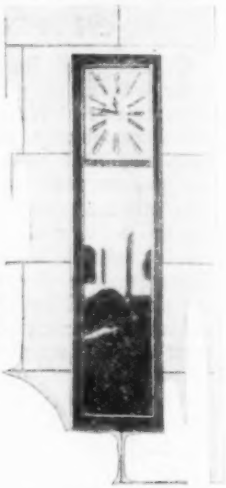
SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



Any Motorist Who Likes to Travel Well Equipped will Appreciate the Good Points of This Running-Board Baggage Rack, Which Replaces Unsightly Ropes and Straps, and Which can be Folded When Not in Use



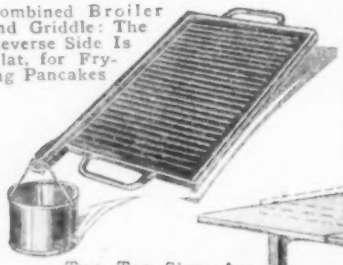
Distinctive Because of Its Unusual Dial and Thinness, the Artistic Clock Pictured at the Right Serves Both as a Timepiece and a Wall Decoration. The Lower Portion of the Dainty Frame Incloses Either a Mirror or a Picture



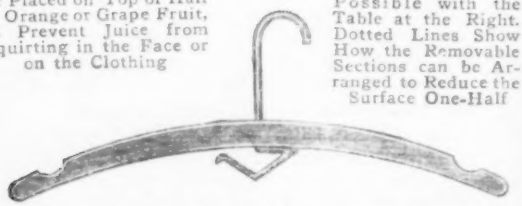
Without Marring the Appearance or Comfort of the Furniture, the Mechanism of a Phonograph is Concealed underneath One of the Massive Hinged Arms of a Luxurious Overstuffed Sofa, While at the Opposite End, Similarly Hidden, Is a Cabinet for Records

Cover of Glass or Other Ornamental Material, to be Placed on Top of Half of Orange or Grape Fruit, to Prevent Juice from Squirting in the Face or on the Clothing

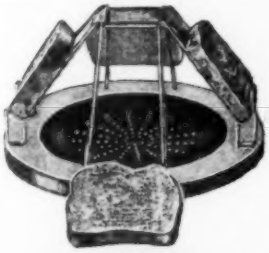
Combined Broiler and Griddle: The Reverse Side Is Flat, for Frying Pancakes



Two Top Sizes Are Possible with the Table at the Right. Dotted Lines Show How the Removable Sections can be Arranged to Reduce the Surface One-Half



Particularly Suited for Holding Women's Gowns, a New Clothes Hanger Occupies Small Space When Fastened Close to a Wall or Door by Inserting the End of the Revolving Hook by Which It is Suspended in a Socket Designed Especially for That Purpose



Protected from the Flame by a Perforated Shield, Slices of Bread are Evenly Browned When Placed on the Wire Racks of This Folding Gas Toaster

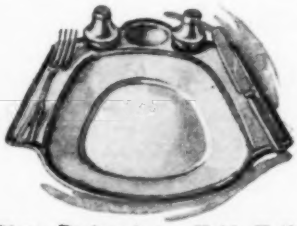
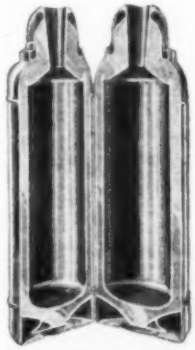


Plate Designed to Hold Knife, Fork, Salt and Pepper Shakers, and Butter Dish, in Addition to Food

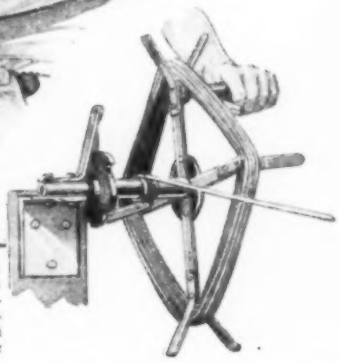
Automobile Searchlight, Road Mirror, and Flag Holder in One Accessory: The Bracket Is Adjustable, and Fastens on the Windshield Frame near the Driver's Seat

A Recent Novelty in Household Furniture Is a Combination Library Table and Writing Desk, the Latter Built in at One End of the Former, and Disclosed, Ready for Use, by Raising a Hinged Section of the Table Top



Made Entirely of Steel, a New Vacuum Bottle cannot be Broken by Rough Handling or Changes of Temperature. Above Is a Sectional View, Showing Its Construction

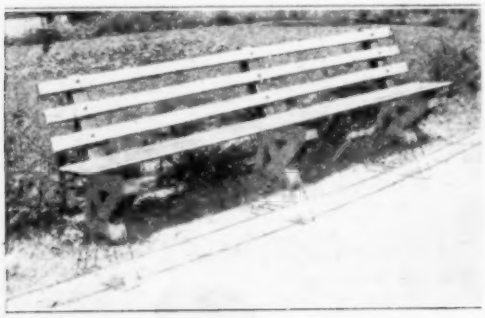
Simple Removable Guard for Converting an Ordinary Razor into a Practical Safety Razor



Clothesline Reeland Tightener: Rope is Wound on the Forked Arms, or Tightened by Winding on the Axle of the Wheel

IMMOVABLE PARK BENCH BUILT OF CONCRETE AND STEEL

Caretakers of Philadelphia's public parks are pleased with the introduction

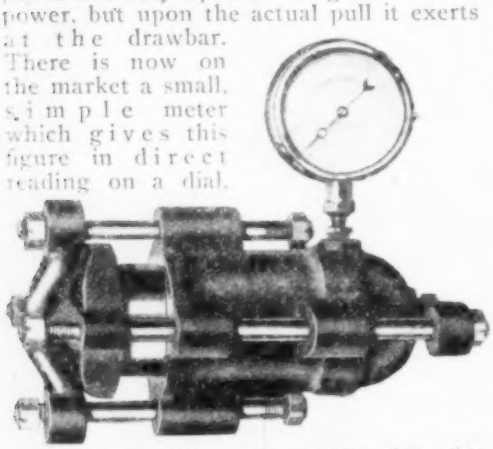


This Picture Shows in Phantom the Underground Portion of an Immovable Concrete and Steel Park Bench Designed by the City Architect

of an immovable park bench. In the past they have been compelled to spend a part of each day redistributing the light steel benches, moved from their proper places during the preceding evening. Some were actually stolen. The new bench cannot be moved, however, as the heavy frame of concrete and steel is sunk 17 in. into the ground. Wooden strips are bolted to the frame to form seat and back.

DRAWBAR PULL REGISTERED BY SIMPLE MACHINE

The work capacity of a tractor depends not only upon its weight or horsepower, but upon the actual pull it exerts at the drawbar. There is now on the market a small, simple meter which gives this figure in direct reading on a dial,

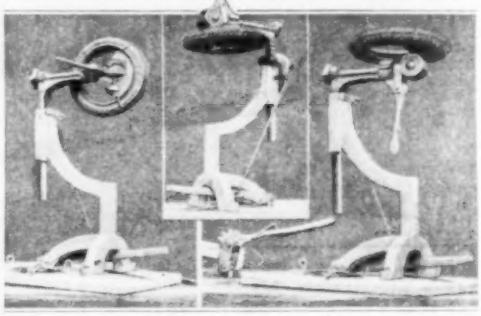


Instrument for Giving Direct Reading of Drawbar Pull or Draft Up to 10,000 Pounds: The Cylinder is Filled with Lubricating Oil

and the operator is enabled to determine at a glance the power of any pull up to 10,000 lb. The mechanism consists of a heavy piston in a cylinder filled with oil, working on the hydraulic principle. The instrument, weighing 75 lb., has only two moving parts and no springs, and may also be used for weighing, or to indicate the draft between any power and its load.

NEW ADJUSTABLE TIRE LAST INVENTED FOR GARAGES

Tire casings are held in convenient position for repairing by an adjustable bench last recently patented by an Ohio inventor, who declares that it will be found valuable in garages and shops where tires are mended. A notched rod running through the upper part of the stand, which supports the device at about the proper height, allows vertical adjustment, while the last form itself, fastened at the end of an arm which connects with



Three of the Many Convenient Positions to Which a New Bench Tire Last can be Adjusted for Repairing Casings

the notched rod at right angles, can be adjusted to hold a tire in four different positions. Wire fasteners hold the casing firmly on the form.

TRAPPERS FEED WILD-ANIMAL CARCASSES TO POULTRY

Though meat, cooked and ground, is known to be a good poultry food, few farmers use it since all meats have entered the luxury class. The number of farmers who trap wild animals for their pelts, however, is growing as the price of furs continues to ascend. Now some of the alert individuals who are combining the two vocations have found that the flayed carcass of fox, skunk, or muskrat, suitably prepared, is as welcome a titbit to poultry as good beef. Thus is another former waste product put to advantageous use.

A RING SUNRISE

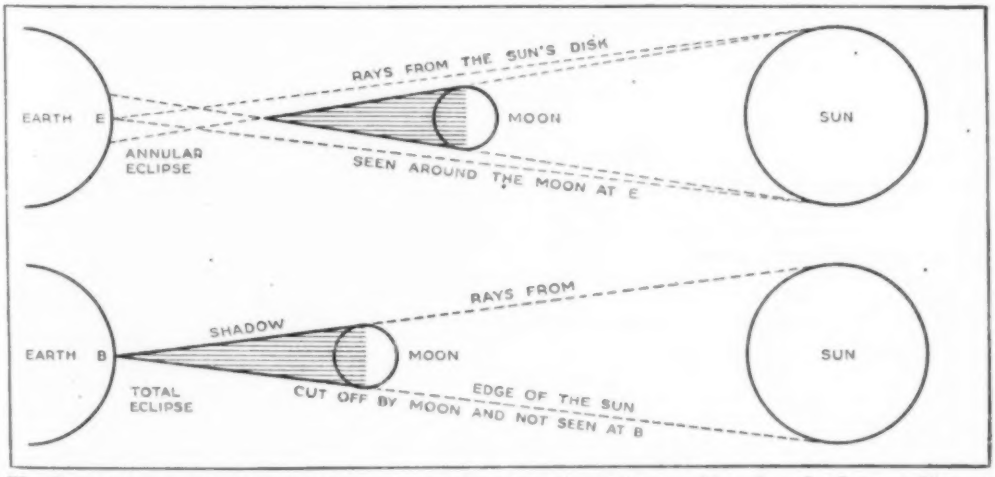
By Latimer J Wilson

Annular Eclipse of the Sun, as It will Appear to Observers in Parts of the United States on the Morning of November 22, 1919: The Ring Effect Occurs Because the Moon, at the Time of the Eclipse, Is at Its Greatest Distance from the Earth, and Its Visual Angle Is Too Small for a Total Eclipse

THE unusual phenomenon of an annular, or "ring," eclipse will be visible in the United States on the morning of Nov. 22, 1919. The central path of the eclipse extends from the vicinity of Timbuktu, Africa, across the Atlantic Ocean to a point near San Antonio, Tex. The natives of the African jungle will behold the sun going below the horizon as a great ring of fire, while the inhabitants of the Texas plains will see his majesty, "Old Sol," come up above the sheets of morning mist in the same curious form.

When the moon passes directly across the face of the sun as seen from a position on the earth, an eclipse occurs. By a coincidence the moon is very nearly the size of the sun as seen in our sky, though in reality it is only about one four-hundredth the diameter of the solar disk. The moon's distance is such that the planet ordinarily appears about as large as the sun, 93,000,000 miles away. But for this remarkable circumstance, we would never see the sun sometimes completely hidden by the moon and at other times not quite screened by the opaque body of our satellite. Thus we can have either a total eclipse of the solar disk or an annular eclipse.

If the earth's atmosphere extended out-



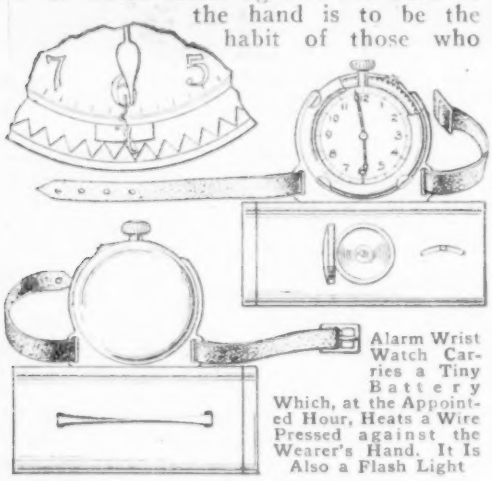
The Upper Diagram Explains the Reason for the Annular Eclipse When the Moon Is at Its Greatest Distance from the Earth, So That the Shadow Cone does Not Reach the Earth; the Lower Diagram Shows How a Total Eclipse is Formed by the Shadow Cone Striking the Earth's Surface When the Moon is Nearer

ward to the distance of the moon we could see the long conical shadow cast by the moon. When our weird satellite is at its near approach to the earth, its orbit being slightly eccentric, the tip of the shadow cone touches the ground and marks a narrow path of totality. The shadow may be large enough for the period of totality to last nearly seven minutes. Such was the duration of the total eclipse of May 29, this year.

But when the moon sweeps across the solar disk at a distance from the earth too great for the tip of its shadow cone to touch the surface, the phenomenon of an annular eclipse occurs. Sometimes both types of an eclipse may occur during the same event, the moon's distance varying enough in the course of its passage to change the character of the eclipse, the ring of fire either fading into blackness or growing out of it.

WRIST WATCH WAKES WEARER WITH SILENT ALARM

To be awakened by the pressure of a bit of warm metal against the back of the hand is to be the habit of those who



Alarm Wrist Watch Carries a Tiny Battery Which, at the Appointed Hour, Heats a Wire Pressed against the Wearer's Hand. It Is Also a Flash Light

adopt a recently designed alarm wrist watch. Fastened alongside the watch is a miniature electric dry battery in a case upon whose back is stretched a small piece of resistance metal. The contacts are set for any desired hour by turning a knob on the watchcase. When the circuit is made by the hour hand of the watch, current flows through the resistance strip resting against the wearer's hand and the rise of temperature awakens him. A tiny lamp bulb on the case makes it also a flash light.

PAINT MALARIAL MOSQUITOES TO FIND RANGE OF FLIGHT

During experiments in malaria control conducted by the U. S. Public Health Service among the rice fields of Arkansas, it became desirable to measure the flight range of the germ-bearing mosquito. About 5,000 mosquitoes were captured and put into glass containers closed with screen. Then, with an atomizer, the captive insects were liberally sprayed with a one-per-cent solution of methylene blue. Some 4,000 survived this treatment, and were liberated at a central point. Starting 60 hours later, recatches were made at 37 different points. Only 10 painted specimens were recaptured, one a mile from the point of release, and nine three-fourths of a mile.

SELECT FOOD BY HEAT UNITS, LIKE COAL, IS ADVICE

Foodstuffs should be retailed at prices based on the number of heat units they contain, instead of by weight or measure, in the opinion of the commissioner of labor statistics. This would enable the consumer to select at all times the most economical menu calculated to yield the necessary 3,000 calories per person per day, and so help to control the cost of living. Even supposedly constant food items—like bread, meat, and potatoes—vary considerably in their caloric content, and price is little indication of value.

FOOT-STRENGTHENING DEVICE SERVES THREE PURPOSES

An appliance for the relief of sufferers from "dropped foot," an affliction characterized by the practical collapse of the feet, has been designed by an English manufacturer of shoes for cripples. It is intended to support the arch of the foot, to brace the ankle, and to lift the toe, thus enabling the patient to walk with comparative ease and comfort. A flat iron frame, shaped to be placed under the arch of a shoe and extend nearly to its top on both sides, is fastened to the outside of the shoe by a strap and two coil springs. The former

BY COURTESY OF THE LANCET, LONDON

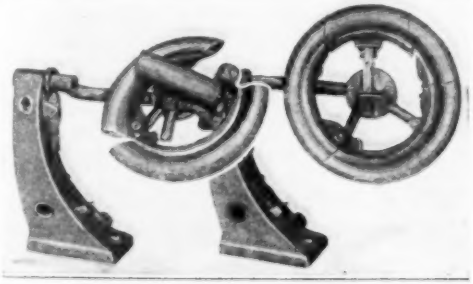
passes through slots in the frame and over the back of the footwear, while the latter are attached to the ends of the frame and secured to the shoe near the lower end of the laced opening.

CAR-WASHING ESTABLISHMENT HAS LARGE CAPACITY

Automatic machinery installed in an enormous automobile-washing establishment, opened recently in an Ohio city, makes it possible for the employes to clean 320 cars in an eight-hour day, or, in other words, four every six minutes. Several steps are taken to complete the cleaning process, which includes thorough washing of every part of the machine, spraying the underside with kerosene and soap, rubbing the body with chamois skin, and removing dirt from cushions and floors with vacuum cleaners. Polishing is optional. Tracks guide the machines to proper positions for treatment with the various devices used. A large building is devoted exclusively to the work.

COLLAPSIBLE CASING FORM MADE IN FOUR SECTIONS

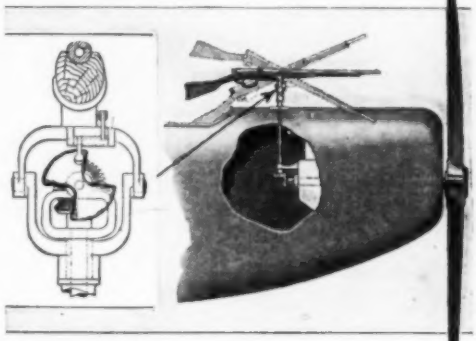
An innovation in collapsible pneumatic-tire building forms is one made in four sections that are hinged on three radiating arms. One of the latter is a rack, arranged so that it can be moved by a pinion in the center of the device. Extended, the sections fit together to make a form over which rubber and fabric can be placed in layers. When the section attached to the rack is withdrawn from the circular shape, by manipulating the rack-and-pinion gear with a socket wrench, all the sections can be folded over, and the tire removed from the form without stretching or disarranging it.



Collapsible Tire-Building Form: On the Right the Device Is Ready for Use, While on the Left Its Sections are Folded

PILOT'S GUN SWINGS FREELY YET CANNOT HIT PROPELLER

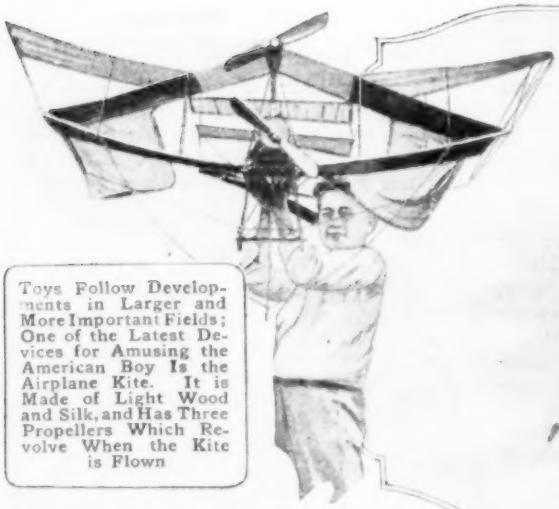
In the military airplane the pilot's machine gun is conventionally fixed to the fuselage so that he aims his weapon by "aiming" his entire ship. This is not the case, however, with a gun of recent patent, which may be turned freely on a universal bearing. Interest centers on the mechanism which prevents the gun from being discharged when a propeller blade is in the line of fire. Just below the gun barrel is a spherical segment, resembling a miniature propeller, and geared to revolve at the speed of, and parallel to, the airplane's propeller. Hanging in front of this segment is a small lever which actuates a locking rod running back to the trigger mechanism. In whatever direction the gun is aimed, the small lever will lock the trigger mechanism when in contact with the revolving segment. The gun will thus refuse to operate when a propeller blade is in the line of fire.



Airplane Machine Gun Which can be Aimed in Any Direction, but Which cannot be Discharged When a Propeller Blade Is in the Line of Fire

CORRUGATED WASHER ON BOLT STRENGTHENS WOOD JOINT

A simple corrugated washer strung on the bolt that holds two timbers together has been found by a Swedish inventor to increase the shearing strength of the joint as much as 100 per cent. The washers, of all sizes, are $\frac{1}{16}$ in. thick, their corrugations $\frac{9}{32}$ in. high. They are strung on the bolts between the timbers to be clamped together, and the nut drawn up with a powerful wrench $2\frac{1}{2}$ or 3 ft. long, to sink the teeth into the wood. Some 48 hours later, and again in about 72 hours, the tightening process is repeated.



Toys Follow Developments in Larger and More Important Fields; One of the Latest Devices for Amusing the American Boy Is the Airplane Kite. It is Made of Light Wood and Silk, and Has Three Propellers Which Revolve When the Kite is Flown

Vegetation Develops Amazingly under the Tropical Sun of British India. In This Picture a Small Boy is Shown Seated on an Enormous Lily Pad near His Home in Madras. With Its Upturned Edges, the Great Leaf Becomes a Living Boat, Anchored by Its Stem, Which will Easily Float a Child. One of the Flowers can be Seen at the Left

Buckets Are Not Common in the Hawaiian Islands, and Bamboo Logs are Used in Their Place. This Little Girl is Carrying Water in One of the Primitive Containers

Nimble-Fingered Japanese Children Find Interesting Employment in the Toy Factories of Their Native Land. This Group of Oriental Juveniles is Assembling the Parts of Tiny Warships, Many of Which are Sold in the United States

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Though Not Particularly Beautiful, This Motor Car Runs, and That Is the Important Thing to Its Owner, the Chinese Boy at the Wheel, Who Helped Make Every Part of the Vehicle

Two Broken Arms Failed to Prevent This Smiling Youth from Making Noise on the Fourth of July. He Used a Heavy Tailor's Iron, Lifting It with His Foot, to Smash Toy Torpedoes

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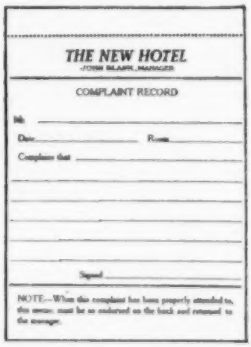
Joined Together since Birth, the 11-Year-Old Filipino Boys on the Velocipede are to be Separated Soon by an Operation. The Twins were Exhibited in an Amusement Park in This Country for a Time, and Later They Became Students in an Eastern School

HOTEL PROVIDES ENVELOPES FOR GUESTS' VALUABLES

Homelike conveniences and studious attention by the management to the comfort of patrons have built an enviable reputation for an Ohio hotel, in which unusual methods are employed to accomplish this result. One of these is a means for safeguarding the valuables of guests who habitually place their money and jewelry under their pillows at night. Large manila envelopes are placed in each room for this purpose. Printed on the envelopes is the information that the safest place for valuables is in the hotel safe, but that the paper containers can be used for hiding them under pillows, if desired, at the owner's risk. It is suggested that some articles of clothing be placed in the envelopes with valuables, so that the latter will not be left behind when a guest leaves a room. Blanks for filing complaints and for reporting articles found are available in each room, as is also a mending outfit, consisting of thread, needles, pins, buttons, and patches.

Placing Money, Jewelry, and Articles of Clothing in an Envelope Provided by an Ohio Hotel for Safeguarding the Valuables of Guests



THE NEW HOTEL
JOHN BLANK, MANAGER

COMPLAINT RECORD

Mr. _____

Date _____ Room _____

Complaint that _____

Signed _____

NOTE—When this complaint has been properly attended to, this envelope must be so endorsed on the back and returned to the manager.

COAL MINERS' SAFETY LAMP USES BENZINE AS FUEL

Benzine, volatile product of coal-oil distillation, scarcely recommends itself as fuel for a safety lamp. Yet in Europe, inspired by the post-war shortage of petroleum, a coal-mine official has succeeded in designing a lamp which burns it without danger, and gives all the required signals of outside menace. Above the flame is a short conical coil of wire, between whose slightly open windings the air rushes in and insures complete combustion of the benzine vapor. The incandescent portion of the flame appears above this wire chimney, and when one-half inch high yields about two candlepower.

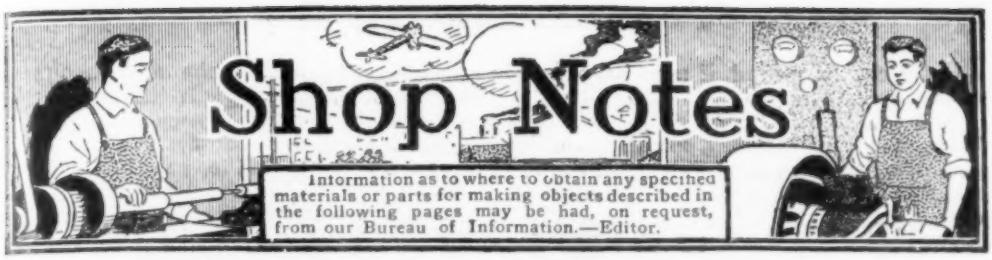
MINE "TIMBERS" OF CONCRETE ARE CUSHIONED WITH SAND

Mine timbers have been successfully replaced with concrete pillars by a Belgian engineer, by making them hollow and filling them with sand. Tenons extending down from the concrete roof enter the pillars and rest on the sand cushion within. This allows a certain amount of settling, and the spiral form of the reinforcing in the pillars provides for a slight additional compression. If much downward movement is expected, the roof tenons are made long, and a hole near the bottom of the pillar allows the sand to be pressed out as the roof settles.

BONE PENHOLDERS CARVED WITH IMPROVISED TOOLS

With a crude set of instruments consisting of a pocketknife, a file, a chisel made of a large needle, and a toothed piece of clock spring that serves as a saw, a prisoner in one of the penitentiaries carves elaborate white-bone penholders and disposes of them by mail. Like many of the trinkets made by inmates of our prisons during odd moments, they represent hours of difficult, tedious work.

To Raise Funds for Counsel, a Prisoner Spends Many Hours Carving Trinkets. Within Each of the Open Spaces in the Penholder, as Indicated, There Is a Tiny Ball That Rolls between Grooves


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

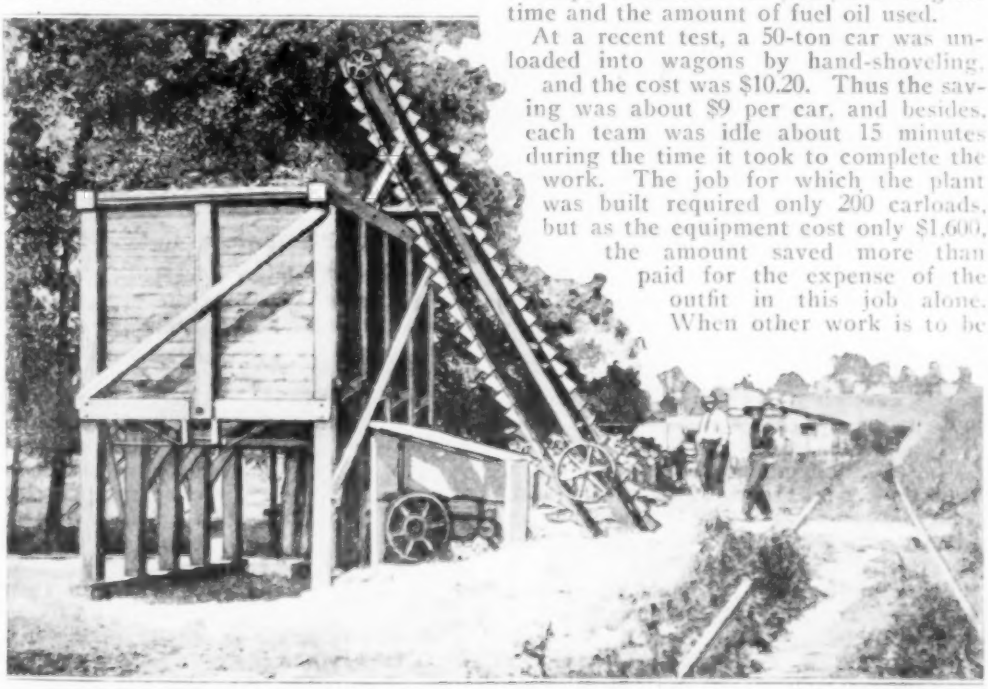
Road Materials Unloaded at Low Cost

By JOHN ANSON FORD

THE great amount of road improvement now being undertaken in various parts of the country gives particular interest to a simple roadside outfit installed by a county engineer, which enables his workmen to unload crushed stone onto trucks or wagons at a cost of $1.25 for 50 tons. This is figured at recent costs for labor and material. As compared with the cost of handling this amount of material by hand-shoveling, or other methods usually employed in connection with road improvement, the method represents a great saving. More important, perhaps, than the saving in money, is the smaller number of workmen required, as scarcity of labor is now a troublesome obstacle to road work.

The equipment includes a storage bin of one-carload capacity, set high enough to permit a wagon or truck to be backed beneath it. Extending above the top of the bin from a pit dug beneath the switch track which runs alongside the bin, is a 30-ft. endless conveyor of a type commonly used in handling crushed stone. This conveyor is driven at small cost by a 9-hp. oil engine. The crushed stone is dropped, from the trap in the floor of the gondola or similar railroad car, into the pit, whence it is conveyed by the elevator to the bin, and then delivered by gravity to wagons as fast as they are drawn into position. An operator can unload a 50-ton car of stone in less than two hours at an expense of not over $1.25, counting his time and the amount of fuel oil used.

At a recent test, a 50-ton car was unloaded into wagons by hand-shoveling, and the cost was $10.20. Thus the saving was about $9 per car, and besides, each team was idle about 15 minutes during the time it took to complete the work. The job for which the plant was built required only 200 carloads, but as the equipment cost only $1,600, the amount saved more than paid for the expense of the outfit in this job alone. When other work is to be



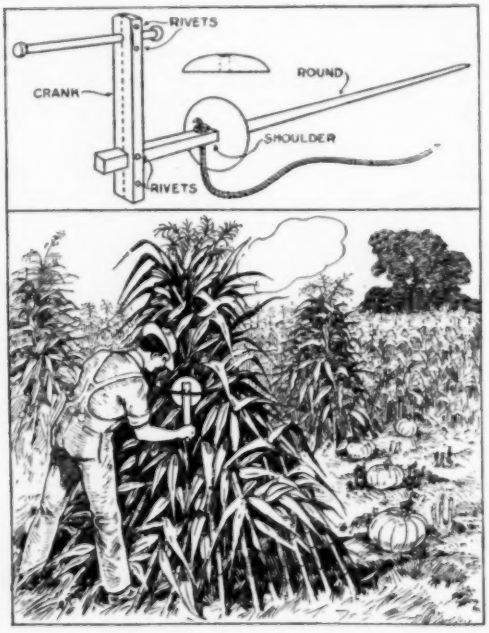
The Cost of Unloading Materials from Railway Cars for a Job of Road Building was Sufficiently Reduced by This Equipment to More Than Pay the Cost of the Whole Apparatus. The Latter could, Moreover, be Readily Moved to Another Location and Used Again

done, it can be moved, if need be, at relatively small expense.

The bin is held together by rods and bolts. No rails are used in the construction, which makes it easy to move the bin from one job to another. The estimated cost of moving it is $150.

A Corn-Shock Binder

A device for tying fodder shocks, both green and dry, is made from a square oak



A Quick-Action Device for Binding Corn Shocks, Both Green and Dry, will Save Considerable Time for the Busy Farmer

stick, about 3 ft. long and 2 in. square. Beginning 10 in. from one end, turn this down to a diameter of 1½ in. at the square shoulder, and gradually bring it to a point at the end.

The disk should be 8 in. in diameter, and turned down to a saucer shape, with a hole, 1½ in. in diameter, in the center. About ½ in. from the shoulder, bore a ⅝-in. hole, and through this run a ½-in. rope, long enough to go around as large a shock as will be made. The rope should be knotted at each end, and one knot pulled up tight against the stick and held there by running a pin between the strands.

The crank is made from two pieces of hard wood, each 1 by 2 by 18 in. Put these in a vise and bore a 1¼-in. hole about 2 in. from one end, for the handle. In the other end make a 2-in. square hole, and run through it the end of the long piece, riveting it securely.

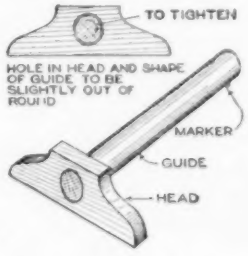
After a shock is set up, run the sharp end into it; put the rope around the shock; pull the loose end between the disk and the fast end of the rope, and turn the crank. The disk will slide down as the rope winds up; when the right tension is received, shove the handle into the shock and put on the band.—F. H. Sweet, Waynesboro, Va.

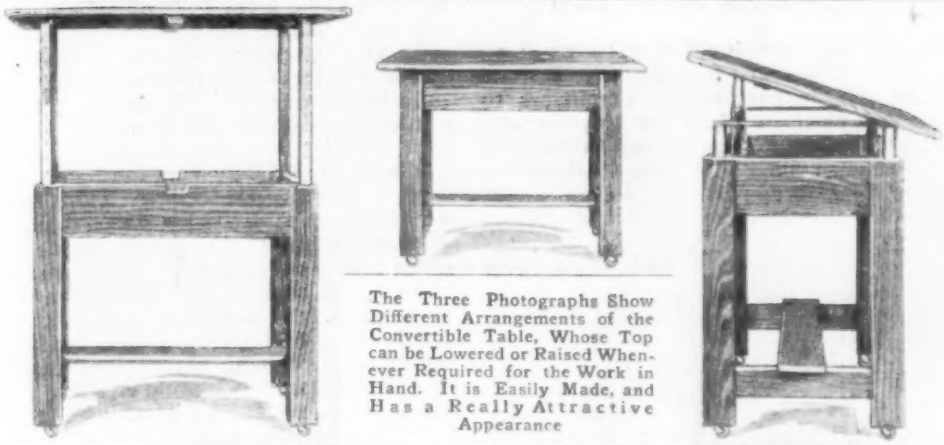
Distributing Surveyors' Stakes Evenly

When distributing surveyors' stakes for work where only moderate accuracy is needed, it is common practice to drive along the line selected, and to drop the stakes at the proper intervals, or as nearly so as possible. It is difficult, however, to judge distances accurately from a moving wagon, and it is not unusual to drop too few or too many, so that they must be carried to their proper locations afterward. To meet this difficulty, procure a piece of cord of the same length as the desired interval, tie a folded newspaper, or some other white object, to one end, and attach the other to the rear of the wagon or truck. Throw out a stake, start ahead, and when the newspaper passes the stake that has just been dropped, throw out another one, repeating until all the stakes are distributed. This method has proved a timesaver in practical surveying, and a test has shown that stakes can be distributed over a distance of a mile in five minutes.

Carpenter's Screwless Marking Gauge

The sketch shows a carpenter's gauge which can be set without using a setscrew. This feature is made possible by the shape of the guide and the hole in the head, which are both slightly oval in shape, and both of the same curvature, so that the head can travel up and down the guide. When the right position is reached, the guide is set by giving it a slight turn, while the head is held stationary. A turn in the opposite direction loosens it again.—Roy H. Poston, St. Francois, Mo.





The Three Photographs Show Different Arrangements of the Convertible Table, Whose Top can be Lowered or Raised Whenever Required for the Work in Hand. It is Easily Made, and Has a Really Attractive Appearance

Convertible Table Has Three Different Uses

Finding my room space scarce, and needing for my purposes several kinds of tables, I built a table which is readily convertible for three different uses. As shown in the central photograph, it is quite like any ordinary library table. Its top is 26 in. by 30 in. in size, and is fitted with an imitation-leather cover and with brass corners. The legs are hollow, 3 in. square outside, and 1½ in. square inside. To the sides of the table a solid bottom is added, and this provides a cabinet for keeping writing or drawing materials.

To the right is shown the form which the table takes when it is to be used for drawing, or for any other work requiring a table of ordinary height with slanting top. For this purpose the inside mechanism is called into use. This consists of four inside legs, slightly less than 1½ in. square and 22 in. long; two hinges at the lower, or near, side of the table top, and two iron bars acting as adjustable braces at the upper, or rear, side. Each pair of legs is joined together by an iron crossbar. The inside legs are all drilled with holes to take steel pins, which, resting on the top of the outer legs, hold the table at any height desired.

To the left is a photograph of the table as raised to a height of about 48 in., this being a convenient height if the user wishes to stand when working. It will be seen that each leg has a number of holes for a steel pin, which can be placed through any hole, in order to give the desired elevation. When thus used, the two braces cannot, of course, be employed, but if it is desired to hold the table top at an angle, this can be done by thrusting a piece of broomstick under the table top, between it and the crossbars.—H. B. Graeff, Los Angeles, Calif.

Movable Partition on Truck

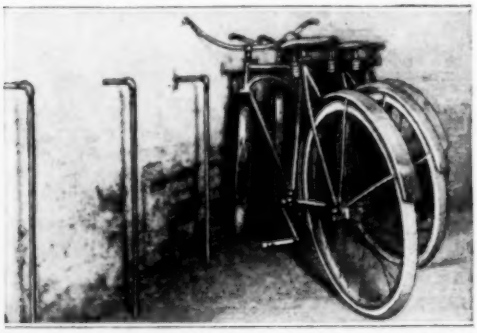
A delivery boy who used a light motor truck on his trips, occasionally had trouble with boxes and crates containing fragile articles, such as eggs, ice, etc. With a full load he had no difficulty, as the boxes had no room to shake loose, but as the load became smaller, they were jolted back and forth about the floor of the truck. He prevented this by reducing the space occupied by the freight, so that it would always be packed tightly, the device used being a sort of auxiliary tailboard, which could be moved forward toward the front of the truck as the load diminished in size, while the floor at the rear was left empty. Rows of holes, three to a row, were bored in the floor across the truck at intervals of one foot, and metal plugs which projected from the lower edge of the tailboard fitted into the holes, so that the board was held in a vertical position wherever needed. For the plugs, short rods were used, flattened at one end to form flanges, so that they could be fastened by screws to the tailboard.—Jack Solon, Natchez, Miss.

¶ Dirt and grease are quickly removed from a carborundum wheel by holding a coarse piece of sandpaper against it, and turning the wheel at a fairly high speed.

Bicycle Racks for the Shop

Many shop employes ride to work on their bicycles every nice day. It is good policy on the part of the employers to furnish a place in which the bicycles may be protected from weather and theft. Two methods are shown in the illustrations.

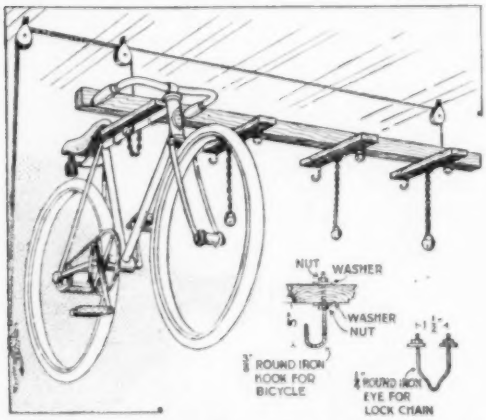
The photograph shows bicycle racks made of pipe inserted along the wall of



Bicycle Racks Made of Pipe, Inserted into the Wall of an Unused Basement, Provide Places for Employes' Machines

an unused basement. This type of rack could be used any place where the wall space is available. Each unit is made of ⅜-in. pipe, is 30 in. high, and is placed 4½ in. from the wall.

For places where room is at a premium, the type of rack shown in the drawing can be used, provided there is enough overhead space. If there is a driveway



In Crowded Places, a Rack Which can be Pulled Up to the Ceiling Takes the Place of the Ordinary Bicycle Stand

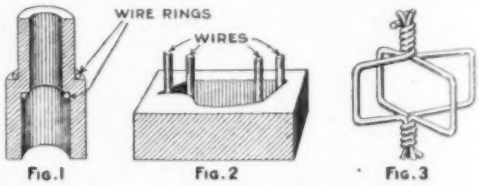
or high-walled room which can be used, it will prove a great convenience and will not be in the way, except during the time when the workmen are arriving or leaving. At other times the frame, with the bicycles slung from it, is pulled up out of the way, clearing the space for other uses.

If any workman desires to leave between regular hours, he must either climb up a ladder to release his machine, or else choose a time when the frame can be lowered without stopping work.

The frame, of 2 by 4-in. lumber, is slung from pulleys on the ceiling. Short pieces of boards provided with hooks hold the bicycles, with chains to lock the machines securely in place. The hooks and U-bolts which hold the chains are made from ⅜-in. iron rod, bent into shape and threaded. The hooks are then padded by wrapping them with electricians' tape, so as not to injure the bicycle enamel. Each workman is assigned a place on the rack for his machine, and provides his own padlock with which he secures his wheel.

Hardening Pieces with Sharp Corners

In hardening pieces with sharp corners, cracks are likely to result at these points. A very satisfactory method of overcoming this is to place wires in the corners, as



When the Piece to be Hardened Has Sharp Corners, Cracking may be Avoided by the Use of Wire

shown. The wires then get hot at the same time as the piece, and in quenching they keep the corner hot a little longer, thereby keeping it soft for a short time while the sides are cooling, and allowing it to accommodate itself to the surface strains set up. These corners, however, seem to become as hard as the rest of the piece, so no hesitancy need be felt on that score.

In the piece shown in Fig. 1, two wire rings are simply placed in the corners. In Fig. 2, a wire form must be placed inside. This may be accomplished by bending the ends of the wires that go in the corners toward the center and twisting them together on both the bottom and top, as shown in Fig. 3.—S. B. Royal, Philadelphia, Pa.

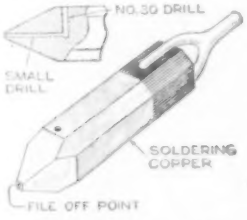
¶To cement leather and brass, place a piece of mending tissue between them, and apply a hot flatiron to the leather. The tissue melts, and the two are firmly cemented.

Piano Keys Repaired with Celluloid

When the ivory tops of piano keys are missing, a good substitute can be made at little expense. Procure a small piece of transparent celluloid, of the kind used for automobile curtains, and cut it to shape. Then mix a small amount of glue with white zinc, so that it acquires the color and consistency of thick cream. Cut a piece of white paper a little larger than the celluloid, and glue the two together; then glue the paper, with the celluloid above it, to the piano key, and place a small weight upon it, to hold it until it is dry. The loose edges of the paper can then be trimmed off, and the celluloid over the white glue and paper will have about the same gloss and color as ivory. —Jack Solon, Vicksburg, Miss.

A Fountain-Pen Soldering Copper

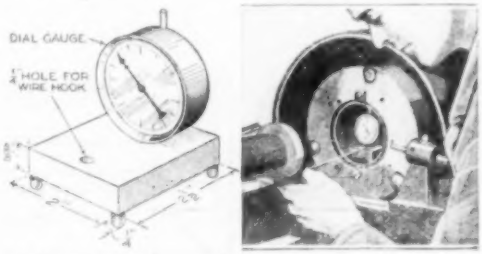
For soldering small work, it will be found convenient to use a soldering copper with two holes drilled in it as illustrated, so that the solder, in wire form, can be held against the opening of the larger hole at the side of the copper, there melting and flowing through the perforation to the point. To make this kind of a soldering copper, first file off the point to produce a flat just large enough for a No. 55 or 60 drill, and drill a hole from the point through the tapered part of the copper. From a spot on one of the parallel faces of the copper, drill a larger hole (about No. 30 or ⅛-in.) to meet the smaller one near its inner end. If the smaller drill is not long enough to reach the point indicated, there is no objection to slanting the larger hole sufficiently to intersect the smaller one.



This type of soldering copper has been found particularly useful for filling holes with solder, as it delivers the solder directly in the hole, whereas with the ordinary copper it is necessary to build up from the side, and the job may not be successful on account of the solder being too thin and opening up. The reason why the center hole must be so small is that the solder will not then run out of it until the copper is touched to the work. Its action is very similar to that of a fountain pen.

Gauging Diameter of Cylinders

The illustration shows a recent method of testing the diameter of a cylinder after grinding. The practice of using a solid plug gauge has been found unsatisfactory in some cases, as that type of gauge is likely to get jammed in the cylinder, and attempts to remove it sometimes have the effect of throwing the cylinder out of line, so that it is necessary to reset it and grind it again. The dial gauge here shown has a small plunger at the top, and the distance to which it is depressed depends on the diameter of the cylinder, which is thus ascertained by reading the dial. The plunger and the legs of the stand are of hardened steel, so that very accurate readings can be obtained. The gauge is thrust along the interior of the cylinder and drawn out again by means of a wire hook, which catches in a small hole in front of the dial. Before using it to measure cylinders of any given model, the gauge must be tested on a ring gauge, ground with great accuracy to the inside diameter desired for the cylinder. A reading of the dial will then show the position which the pointer must indicate when the cylinder has the required diameter.—J. J. McIntyre, Bridgeport, Conn.



A Dial Gauge, Equipped with a Light Spring Plunger, Measures the Interior of a Cylinder without Danger of Getting Jammed

To Keep Paintbrushes Soft

On many painting jobs it is necessary to leave the work for a while, returning to it again to use the same color and brush as before. In such cases it is waste of time to clean the brush. Take it out of the pot, lay it on a piece of waxed paper, wrap it up, and wind the end of the paper securely around the brush handle, twisting it tightly at both ends. This will prevent the air from reaching the brush part, which will be perfectly supple when needed, no matter how long a period has passed since it was wrapped up.

Simple Electric Furnaces Using Resistance Wire

By THOMAS W. BENSON

WHERE temperatures up to 1,100° C. are required in the laboratory, for ignition or other purposes, nothing is

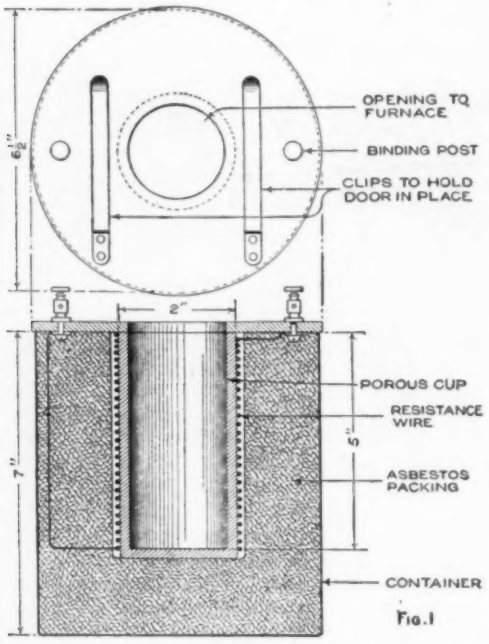


Fig. 1

The Smaller Furnace can be Built in a Tin Can, with Pipe Covering as a Heat Insulator

superior to a furnace of the resistance-wire type. They are not only preferable on account of their cleanliness and ease of operation, but cheaper to operate than a gas furnace of the same rating.

The two furnaces described cover the usual range of requirements for the experimenter and chemist, and are cheap to construct. The maximum temperature of 1,100° C. (2,012° F.) will be reached when the furnace is connected directly to a 110-volt current and its opening covered. Lower temperatures may be maintained by the use of a lamp bank.

In Fig. 1 is given the various details of the construction employed. The foundation for the furnace consists of a porous cup, such as used in two-fluid batteries. This cup measures 2 in. in diameter and is 5 in. deep. The heating element is wound directly onto this cup, and consists of 32 ft. of No. 20 gauge nichrome wire.

In winding the cup, one end of the resistance wire is held in place with a few turns of iron wire. The winding should be made evenly, but at the open end of the cup the turns should be closer together, due to the greater radiation of the heat. Sufficient wire should be left free at each end to make connection to the binding posts.

The winding must then be coated with a refractory material, to insulate it and protect it from air and acid fumes. The best mixture to use for this purpose consists of one part of kaolin to three parts of ground quartz. The kaolin and ground quartz are mixed up with water into a paste, and plastered evenly over the winding, taking care to fill all spaces between the wires. The coating can then be baked by passing a current through the winding, sufficient to heat it to a medium temperature. When dry, repair any cracks in the coating with paste, and paint the whole with dilute water glass.

The furnace chamber is now to be mounted in a heat-retaining chamber. The container may be of tin or asbestos board, as preferred, the packing being asbestos. A good method of constructing this heat-retaining chamber is to obtain a short length of 2-in. pipe covering, and fit a tin can around it.

The top of the furnace should be made

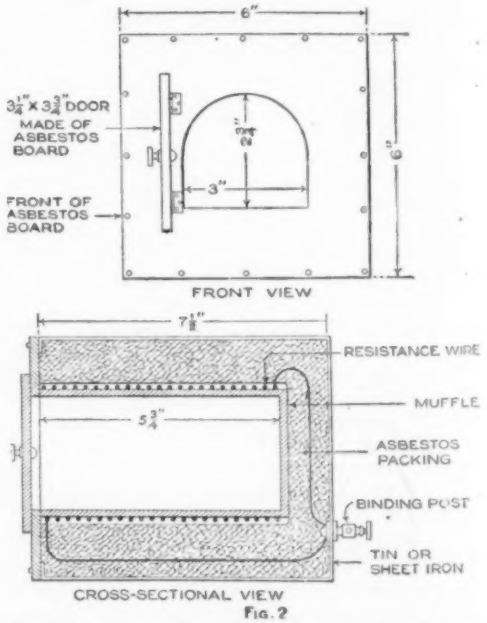


Fig. 2

The Larger Furnace will Require a Little More Work in Building, but will Accommodate Somewhat Larger Objects

from asbestos board, ¼ in. thick. This is drilled, for the binding posts and the

screws holding the clips, as shown in the illustration. A hole is also cut the same diameter as the interior of the furnace chamber.

Connections for the furnace are given in Fig. 3. A lamp bank is used, with sufficient lamps to pass three amperes. Six 16-cp. carbon lamps will be right for the purpose. The lamps and a switch are mounted on a board fastened to the wall for convenience, flexible leads running to the terminals on the furnace.

The furnace is used in the upright position when melting metals or alloys, but for heating solids it may, when desired, be laid on its side, a strip of thin asbestos board being slipped in to form a flat bottom. By means of the clips on the top of the furnace, a piece of mica may be held in place to form a door, and thus keep the temperature constant while allowing the reactions in the furnace to be observed.

The larger muffle furnace is shown in Fig. 2. The method of construction is the same, the difference lying in the higher current consumption necessary to heat the muffle. The winding consists of 65 ft. of No. 17 gauge nichrome, on a muffle 3 in., wide, 2¾ in. high, and 5¾ in. long. The muffle can be purchased for about $1 at a chemical-supply house.

The container for this furnace is square, being made of heavy tin or sheet iron. The front, however, is of asbestos board, in which is cut a hole the same size as the muffle opening. The door is made from asbestos board, and swung on two small hinges. The binding posts are mounted on the back, and are thus out of the way. The heating element is prepared like that for the smaller furnace.

The lamp bank used with the larger furnace should pass five amperes, either ten 16-cp. or five 32-cp. carbon lamps being used, as desired. For closer regulation of the furnaces, water rheostats may be employed capable of passing the current required by the furnace.

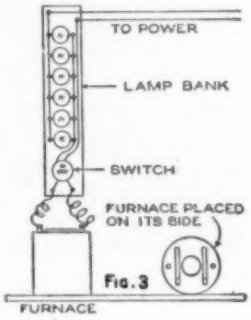


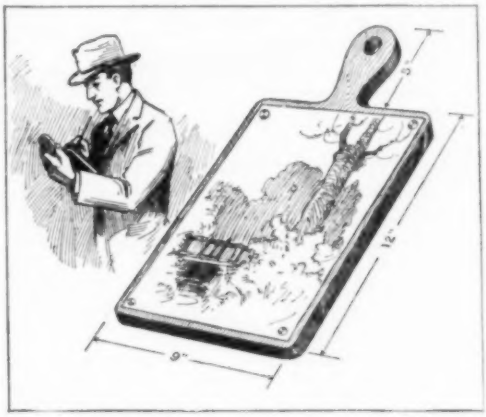
Fig. 3

The temperature of the furnaces can be determined by mounting a chemical thermometer in them, or by calibrating the furnace in such a manner that the temperature is indicated by the amount of current flowing in the circuit.

The cost of building any of these furnaces should not be over two or three dollars for the cup, or muffle, ground quartz, kaolin, wire, and asbestos board. Most of the other material can usually be obtained around the shop or laboratory.

A Handy Sketch Pad

A convenient form of sketching board, suitable for field work, can be made as indicated in the illustration. It is held steady against the body by grasping the projecting handle, through which a hole is bored so that the board may be hung up when not in use. If made of wood soft enough to admit thumb tacks, a day's supply of paper can be fastened to the surface, to be used as required.—C. Nye, Bronx, N. Y.



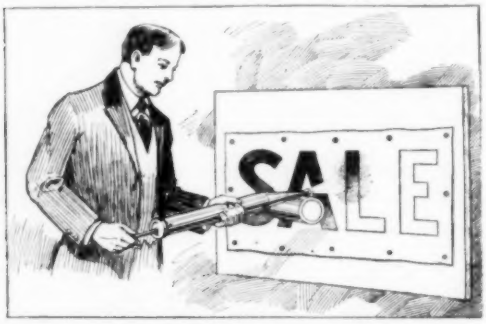
A Projecting Handle Makes a Small Drawing Board Easy to Hold, or to Carry When Not in Use

Funnel Made from Oilcan

A garage mechanic frequently found difficulty in filling automobile vacuum tanks, owing to the small size of the opening at the top. The work required a funnel, but he had none small enough to do the filling neatly and without spilling. He therefore made one out of an ordinary oilcan. He removed the bottom, and cut about 1 in. off the spout, so as to make it sufficiently wide to insure a reasonable speed of flow, without being so wide as not to fit the openings in the tanks. The funnel was made in a few minutes, and proved far more durable than many of the larger ones used in the shop.

Signs Painted with Plant Sprayer

The drawing shows the method used by a merchant to make sales signs cheaply and efficiently. After determining the size and wording of the signs, he cut



A Sprayer, of the Type Used to Rid Plants of Insects, is Put to Good Use in Making Store Signs

stencils for the various letters from ordinary wrapping paper, or old newspapers. These stencils are placed against the surface which is to receive the sign, and held by thumb tacks.

A sprayer, of the type used to apply insecticides in liquid form to plants, is filled with ordinary show-card color. At various times the merchant has tried common ink, carefully mixed water color, and a solution of dye in water. The latter is not practical unless a small amount of gum arabic is used in the solution. The sprayer is used to distribute the color evenly in the perforations of the stencil. If desired to make a deeper color, it is only necessary to spray the surface a second or third time, first allowing the preceding coat to dry.

By using commercial stencils, which can be bought cheaply, an accurate, pleasing sign can be made quickly, cheaply, and without much trouble.—J. Horace VanNice, Waukon, Ia.

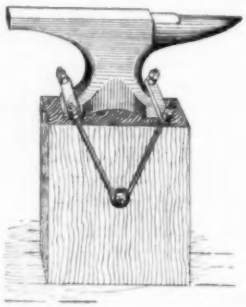
Sawdust Smothers Oil Fires

A bucket of water will only scatter a fire from burning oil or waste, making it more difficult to control. Instead of using water, keep in the garage, or wherever such fires are likely to start, a bucketful of clean sawdust with which has been mixed a pound or two of common soda. The sawdust will effectually smother a small blaze, and if the fire is very hot, the soda will give off a gas which aids in smothering the flames. Care must be taken to see that the sawdust is not oil-soaked.

Keeping Small Tools Rustless

Anyone who has a collection of small tools, such as taps, drills, etc., will find it a good plan to line the tool drawers with corrugated paper, so that each tool will keep its proper place, and be easily identified. If the atmosphere in the neighborhood of the drawer contains considerable moisture, as is likely in districts along the coast, it is advisable to saturate the corrugated paper with oil, so that it may creep around the small tools, and preserve them. As the numbers stamped on taps are usually too small to be easily read, it is good policy to glue a strip of white paper to the corrugated board at the position occupied by each tap, with the number, size, and number of threads per inch clearly marked.

Fastening a Heavy Anvil



To fasten an anvil securely, pass a rod horizontally through the block, so that each end of it will hold a V-shaped tie-rod, which is fastened to metal straps passing along the base of the anvil on each side.

Flowers Preserved by Sand Filling

Most flowers can be preserved by filling the parts with clean sand, and in this way they can be made to retain their natural color and shape. A bloom treated in this way should be buried in a box filled with sand, and left for about ten

Flowers Filled with Sand, and Afterward Dried in a Box, will Retain Their Color Indefinitely

days. After this period it will be completely dry, and will keep indefinitely.—S. Leonard Bastin, Bournemouth, Eng.

Carbon Bisulphide for Destroying Field Rodents

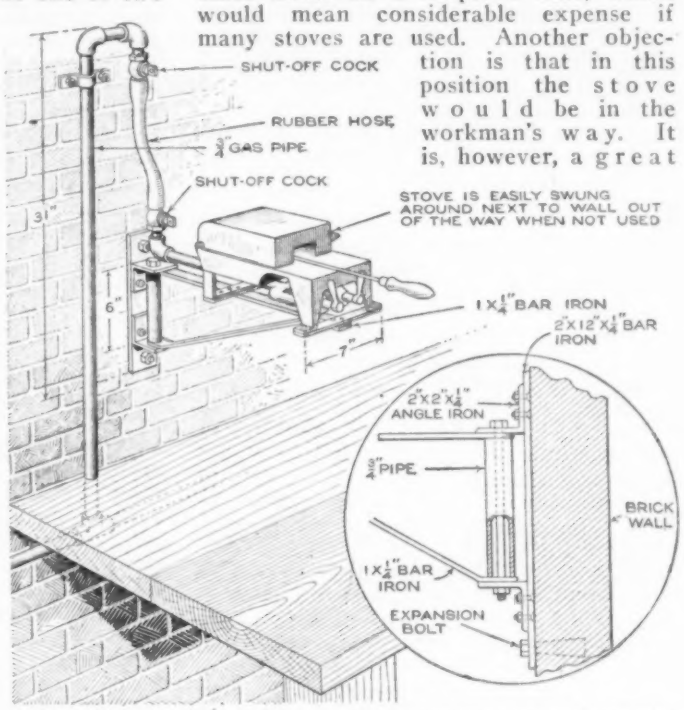
The woodchuck, one of the most destructive rodents, can be destroyed by applying carbon bisulphide to the burrow. This liquid, which can be purchased at most drug stores, evaporates quickly and forms a poisonous gas. To get the best results, close all but one or two of the burrow entrances, leaving those open which are at the highest elevation, and apply the liquid through these. In this way the gas, which is heavier than air, and therefore sinks to the lowest level, will penetrate to every part of the burrow. Attach a loose wad of cotton waste or rags to a pliant stick, and saturate it with half a teacupful of the liquid. Insert the stick into the opening, and run it as far down as possible, after which the entrance must be plugged up. The gas generated will in most cases kill the pest, but in porous soil he occasionally escapes by retreating to one of the higher passages, where he digs into fresh earth. To make sure of destroying him, open the burrow about 10 minutes after the liquid is applied, and explode the gas with a piece of burning refuse at the end of a stick. When doing this, be careful to stand well to one side of the hole, so as to avoid being burned by the flame of the exploding gas.—Alvah H. Pulver, Sodus, New York.

Forgeman's Stationary Scale

A set of graduations stamped along the side of an anvil will sometimes prove as great a help to a blacksmith as an extra pair of hands. As a rule, he needs one hand to hold his work and the other to use the hammer, so that handling a scale is a matter of considerable difficulty. If it is not convenient to stamp the graduations, an ordinary metal scale can be attached to the anvil.

Soldering-Iron Heater Mounted on Swinging Support

In shops where gas stoves are used for heating soldering irons, melting babbitt, or for any other purpose, there are various disadvantages in keeping a stove on a bench. It is likely to be upset, and fire-insurance inspectors would in many cases insist on a fireproof base, which would mean considerable expense if many stoves are used. Another objection is that in this position the stove would be in the workman's way. It is, however, a great advantage to have the stove within easy reach, instead of having to make a special trip whenever heating is to be done, and the arrangement shown in the illustration has been tried with good results.



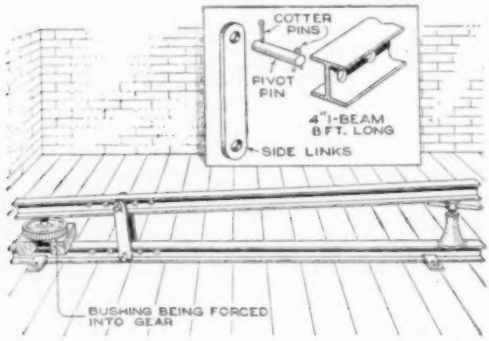
A Pivoted Bracket, Attached to a Wall, Supports a Soldering Stove without Wasting Bench Space. The Cheapness with Which the Equipment can be Installed Is Another Valuable Feature

The stove rests on a swinging bracket, about 15 in. above the bench, and can be turned either to the right or to the left, so that one workman can stand on each side of it, and every stove thus will do double duty. When the stoves are not needed, they can be swung back against the wall, so that they will not be in the way, and no bench space will be wasted. Where electricians, armature winders, or tinsmiths are employed, work can be done far more handily by this method than under the usual conditions, and by allotting separate stoves to each pair of work-

men it is possible to eliminate much of the confusion which is responsible for serious waste of time. The selection of the materials needed for installation will depend to some extent on conditions in each shop, but the arrangement shown in the detail on the right of the illustration will be a fairly dependable guide. A slightly different adjustment is shown in the perspective, but here the construction is not quite so strong, as the horizontal members of the angles which support the pivot are turned toward each other; if turned as shown in the detail, they give greater security. The cost of the materials should be about $1.75, not counting the price of the stove.—Arthur F. Cox, Chicago, Ill.

A Cheap Heavy-Duty Press

A substantial press for heavy work, as straightening shafts, axles, forcing in



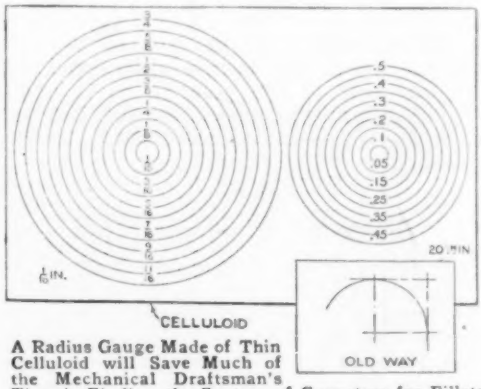
A Screw Jack and Some Scraps of Steel will Form a Very Powerful Press, Useful for Many Purposes around the Small Shop

bushings, and punching holes through steel plates, can be made from 8-ft. sections of 4-in. I-beams and a jack. One beam is placed on the shop floor, and anchored with clamps and lag screws, if desired. The other section is mounted, 18 in. or more, as desired, above the first, and a fulcrum made by drilling 1-in. holes through each beam, passing two pivot pins of similar size through two opposite holes, and extending them through the side links as shown. The purpose of drilling a row of holes is to provide means of changing the location of the fulcrum, with consideration to the pressure required and the distance through which this pressure must act. The fulcrum, when placed farthest from the jack, gives the greatest pressure, but the movement is correspondingly limited. Suitable blocks to support the part being worked on, and to make up for varying widths, are to be used in conjunction with the press in a small shop.

Locating Centers of Curvature

A job which the mechanical draftsman has to do a great many times is to determine the center of curvature for a small fillet. It does not require a great deal of time to do this with the bow pencil, but where it must be repeatedly done, the amount of time consumed is considerable. Where this is the case, draftsmen may find the gauge illustrated to be a great convenience. It consists merely of a number of concentric circles spaced by steps of 1/16 in., 1/20 in., or any convenient distance. At the center of the circles is a small hole just big enough to take the pencil point. When a fillet is to be drawn, the proper circle is selected, and placed over the corner so that it is tangent to both sides of the angle. The pencil point is then placed through the gauge and a mark is thus made for the center of the fillet curve. It will not be necessary, ordinarily, to place the bow pencil in position and draw the fillet in, as it can be easily sketched in with the pencil. When the drawing is inked in or traced, the fillet can be drawn accurately with the bow pen, using the center determined.

Another method of marking the gauge will be useful where there are one or more standard lengths for the radius of fillets. The circles can then be drawn, each representing the correct curvature for a certain scale. The circle to be used will then be decided with reference to



A Radius Gauge Made of Thin Celluloid will Save Much of the Mechanical Draftsman's Time in Finding the Centers of Curvature for Fillets

the particular scale to which the drawing is made.—Ben Frantzreb, Indianapolis, Indiana.

Hammer Handle Kept from Slipping

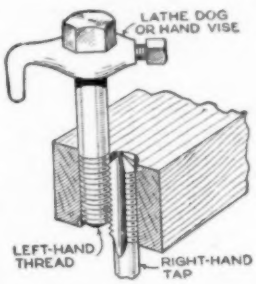
Mechanics sometimes find that they can get a better grip on a hammer if they make a few notches on the handle where it is grasped by the fingers. In order to place the notches correctly, rub a little chalk on the inside of the fingers, and grasp the handle in the natural way. The chalk will show the right locations, and the wood can be chiseled or filed out at these points.—C. C. Spreen, Detroit, Michigan.

Ladder Has One Adjustable Side

A ladder with an extension on one side is very handy on a farm or for the repairman wherever the ground is uneven. It is also useful when work is being done on a staircase wall.

Right-Hand Tap of Same Pitch Cuts Left-Hand Thread

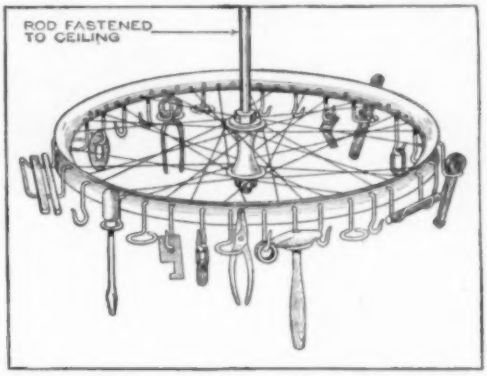
When a left-hand thread is required on a bolt and no left-hand die is available, it is possible to cut the thread by the use of a right-hand tap of the same pitch, though not necessarily of the same diameter. To do this, bore two holes in a piece of hard wood in such a way that they will cut into each other, the sizes of the holes being equal, respectively, to those of the bolt and tap. The tap is screwed into one hole and held rigid; the other hole serves as a guide for the rod to be threaded. It is screwed into the hole just as it would be screwed into a left-hand die; as the metal comes against the cutting edge of the tap, a left-hand thread on the bolt results.—J. H. Moore, Toronto, Can.



¶The skin of the human palm has been found to be a very delicate and effective strop for razor edges.

Tool Rack from Bicycle Wheel

A machinist who used a large number of small tools in his work found that he



A Bicycle Wheel Supports a Workman's Tools above His Head, and Enables Him to Reach Any Tool Desired by Giving the Wheel a Turn

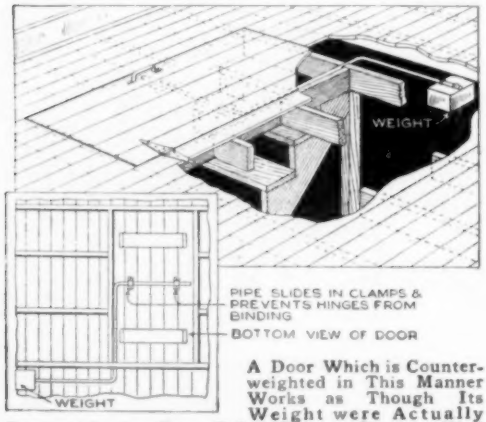
lost considerable time in trips between the tool lockers and the bench. It was not practical to fit a tool rack, or shelf, to the wall above the bench, since the tools were so numerous that it would have been impossible for the workman to reach all of them without letting go his work. Accordingly, he made a revolving rack out of the front wheel of an old bicycle. He removed the tire and axle, and ran a long 5/16-in. rod through the bearings, fastening it loosely with bolts on both sides of the wheel, so that the latter would revolve easily. The top of the rod was secured to the ceiling, and the wheel hung at rather more than the height of a man above the floor. A number of 1/16-in. holes were punched all around the rim, and short pieces of wire were fastened in them, with the free ends bent into hooks, to support the tools. In this way, a workman could reach any of the tools with one hand, while holding his work with the other. It was merely necessary to give the wheel a spin, and any tool desired came within easy reach.

Removing Putty from Glass

When putty has hardened with age, it is a rather delicate operation to remove it from a window pane. Old putty can, however, be removed from glass if nitric or hydrochloric acid is used to soften it. Paint it well with the chemical, using a small brush, and let it stand for an hour. At the end of that time it will be thoroughly softened, and can be wiped off without difficulty.

Counterbalanced Floor Door

The illustration shows a method used to reduce the labor of opening a floor door leading to a cellar stairway. A piece

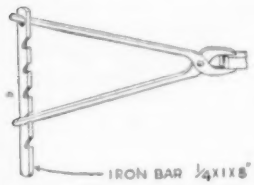


A Door Which is Counterweighted in This Manner Works as Though Its Weight were Actually Decreased, the Door Being Easy to Close as Well as to Open

of 1-in. pipe was bent to the shape indicated, and the door was fastened to one end of it by sheet-iron clamps. At the other end was fastened a weight, almost equal to the weight of the door. The effective weight of the door is thus reduced to a very small fraction of its true weight, and it is easily opened by a child. The great advantage of such a counterweight over the methods of using a spring, or a weight hung from a cord, is that the counterbalancing force is nearly equal to that of the door in any position.

Lock for Blacksmiths' Tongs

The lock or catch illustrated was made by a country blacksmith, from a piece of ¼ by 1 by 8-in. iron. It increases the capacity of each pair of tongs, as the handles can be held tightly, even when opened far beyond the grasping ability of the smith's hand. Also, as the work is held by the lock on the handles, the whole can be turned or laid down without any danger of dropping the hot iron. A slight depression should be made in the upper handle to fit the edge of the round hole in the lock. In use, the handles are sprung sufficiently to let the bar enter this depression.—James E. Noble, Portsmouth, Ontario.

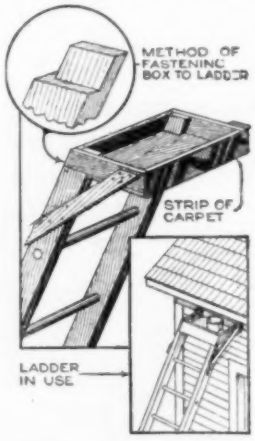


Resurfacing an Old Wooden Bridge

In a western state the floors of wooden bridges are given a waterproof surface, which not only protects the wood, but makes a smooth, durable roadway. The cracks between the floor boards are first filled with wooden strips. A layer of sand and gravel is then placed on the boards, and is covered with a heavy coat of clay. This is saturated with a good grade of road oil, and the surface is soon packed to a hard, smooth finish by the traffic over the bridge. A bridge that has been treated in this way will not give a bumpy ride to cars passing over it, and the life of the timbers will be considerably increased.—W. L. Prouty, Denver, Colorado.

Ladder Head for Painting

The amateur house painter occasionally gets into difficulty when working close under the eaves trough at the top of a house wall. Unless the ladder is long enough to rest against the gutter, he has hardly room enough to paint that part of the wall against which the ladder rests, and when he works on the gutter itself, he is in an insecure position, as his foothold on the ladder is too close to the wall for him to balance properly. The difficulty can be met by furnishing the ladder with a small platform at the top, which will maintain a short distance between wall and ladder, and if it is made in the form of a box, it will hold paint pots and brushes. The box is very easily put on or removed. It may be made of ordinary ⅞-in. lumber, and should extend about 10 in. from the top of the ladder, but no more; a greater distance would make it difficult for a workman to reach the wall when standing on the lower rungs. If the sides of the box are about 4 in. high, they will give sufficient strength to the construction, and will provide the necessary security for brushes and pots, while working in insecure positions.



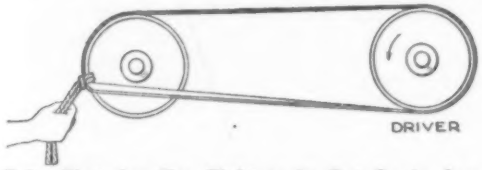
Grease Gun for Applying Cement

An automobile grease gun was used in amateur building operations by the owner of a house which began to show signs of wear. An ornamental facing block, that had fallen from the base of a stone column, was fastened in its former position, with cement. Before the cement was applied, a few large nails were thrust between the block and those above and below it, so as to keep them separate, after which the cement was forced into the spaces with the grease gun. When it had dried, the block was firmly fixed.

Putting on a Tight Belt

At times a belt is so tight that it is almost impossible to put it on the pulley with the power turned on or off. By using a rope, as shown in the sketch, the belt may be handled easily.

The belt is placed on the drive pulley, then on the other pulley as far as possible. A loop of the rope is passed over the rim of the pulley and around the belt, the free ends of the rope being passed through the loop. This is really a slipknot around the belt and pulley. When



Belts That Are Too Tight to be Put On in Any Other Way may be Handled Easily by Using a Rope

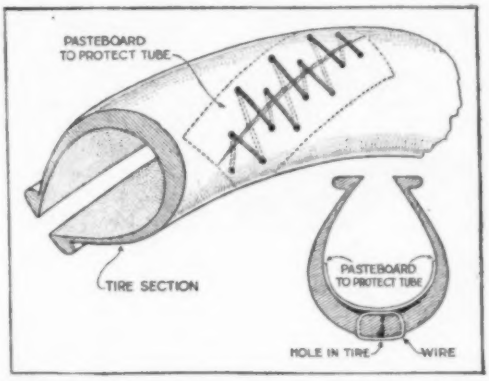
the power is turned on, the rope holds the belt to the pulley until it slips into place. As the belt leaves the pulley on the other side, the rope is pulled out of the hand, and, as the increasing distance opens the slipknot, the rope falls to the floor. If the belt is heavy or the rope rough, it is advisable to wear a glove while putting on the belt, and care should be exercised in turning on the power. This method has been used very successfully, and is a great timesaver.—S. B. Royal, Baltimore, Md.

Typewriter Oiled with Pen

When a typewriter is being lubricated, too much oil does as much harm as too little. The quantity can be controlled by using a clean pen, which is dipped in the oil, and pressed lightly on the surface where lubrication is needed.

Tire Blow-Out Repaired with Wire

An effective, if somewhat crude, temporary repair for a blown-out tire casing is made by simply lacing with soft-iron wire in the manner shown. A series of



While Repairing a Tire Casing with Wire is Not to be Recommended as a Regular Practice, It can be Done in This Fashion When No Other Means of Repair Is at Hand

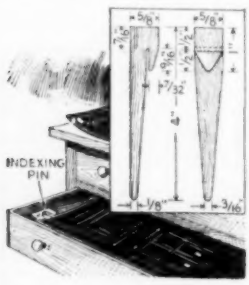
staggered holes are made in the fabric on either side of the hole, and the wire is threaded in and out in a manner similar to the lacing of belts. A piece of pasteboard is placed inside of the tire to protect the inner tube from cutting on the wire. Such a repair cannot, of course, be recommended for use over any length of time, but wire is often one of the easiest things to procure in case of such an emergency on the road, and it may save a drive "on the rim."

Drills Ground for Rapid Cutting

In using a small air-driven or breast drill for drilling oil holes, centering shafting, etc., the drill can sometimes be made to "bite" better, and thus drill quicker and easier, by grinding the drill as indicated by the dotted lines in the figure. The idea is to reduce by one-half the total length of the cutting edge. On one side the point cuts; on the other side the lip does the cutting. The objection to this practice is, of course, the difficulty and frequency of grinding. The form indicated at the left will probably be found to last a little better; the one at the right will be a little the easier to form on the grinding wheel.

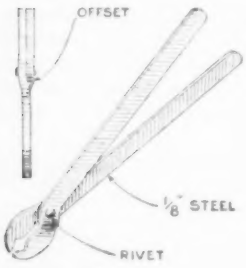
"Out" Pin Aids in Filing Tracings

Wooden pins, constructed as shown, were used by a drafting-room file clerk, to aid him in keeping track of tracings and blueprints which had been borrowed from his filing cabinet. Two narrow grooves were cut in each pin, as shown in the detail drawing. On withdrawing a blueprint or tracing, its number was written on a paper slip and thrust into the outer groove, and the edge of the sheet immediately above it was thrust into the inner groove. The paper slip projected at the side of the pile of sheets, so that it was easy to find the right location when the missing sheet was to be replaced.—Henry G. Appleblad, West Haven, Conn.



Handy Pliers for Turning Nuts

The cut shows a very handy tool, which has been used with success in repair work on typewriters and adding machines. It is made from steel, about ⅛ in. thick, and will fit hexagonal nuts over a considerable range of size. The jaws are offset so that they come directly opposite each other. With this wrench one can get into many narrow places where ordinary wrenches or pliers would not fit. To make a durable tool, the jaws may be casehardened after they are bent to the proper shape.

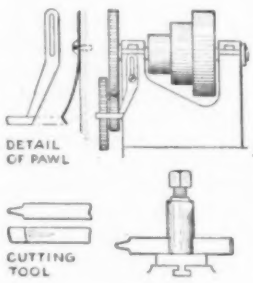


Valve-Grinding Compound as Polish

Valve-grinding compound, as an emergency substitute for metal polish, has given excellent results on brass and iron. If the metal is very badly tarnished, a coarse grade should be used first, and finer ones afterward; but in most cases the medium, or fine, grades are the best to use. They produce as bright a luster as the best metal polish, and are very easy to work with.

Gear Cutting in a Lathe

The cutting of gears in a lathe is a process which can be carried out by a number of different methods, but it would be hard to find a simpler one than the one here illustrated. First, a hole is drilled and tapped near the outer end of the headstock, for a No. 8 machine screw. A spring is then cut from a piece of No. 16 gauge spring brass or bronze, to the shape shown at the left. This is to act as an index pawl. The spring, when mounted on the headstock, with its lower end fitting between the teeth of the screw-cutting gears, prevents the lathe spindle from rotating. After the spring is lifted from contact with the gear teeth, and the gears are rotated until the spring fits in the next space between gear teeth, the spindle will have revolved through a certain angle. In this way, by selecting the proper gears, the spindle can be indexed for cutting any ordinary number of teeth. The process of finding by calculation the proper gears to use in any particular case varies with different lathes, but one familiar with the lathe should have no difficulty in working this out, if he understands the simple shop arithmetic with which every machinist should be familiar.



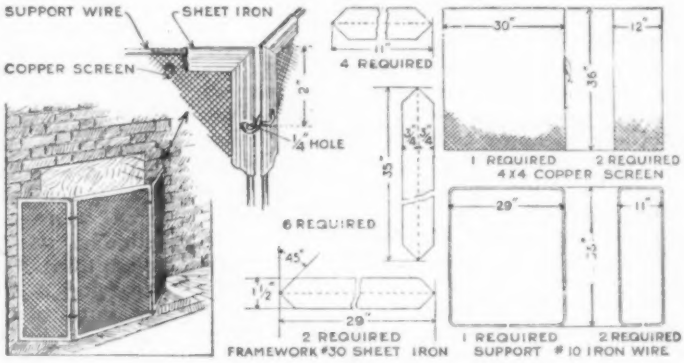
The cutting of the teeth is done by a piece of ¼-in. square tool steel, which is ground by experiment to the proper shape to cut the tooth wanted, and is then gripped directly in the tool post. The main feed of the lathe is used in cutting the teeth; the tool is moved once across the face of the gear blank, and is then moved back and set a trifle farther in, with the cross feed, before the next cut is taken. The depth of the cut should be determined in the ordinary method, or can be found in gear-cutting tables. The tables will not apply, however, unless the tool is accurately ground, so that the root and outside diameters of the gear should be accurately measured after cutting, if possible.

The process is, of course, a very slow one, but in an emergency it is one which may prove very useful.—C. A. Pease, Monrovia, Calif.

An Inexpensive Grate-Fire Screen

Fire screens are a necessity if one would leave a grate fire with any feeling of security over night. Upon inquiring the price of these screens at several hardware stores, I found that the very cheapest cost $9, while the better grades went as high as $18. These prices were a bit too high for me, so I set out to make my own screen. The material required consists of 28 sq. ft. of copper screen, 4-by-4 mesh; 24 ft. of No. 10 gauge iron wire, and some strips of No. 30 gauge sheet iron. The labor involved in constructing the screen is as follows:

Cut the screening into the sizes required, and bend the heavy wire into rectangles, as shown in the drawing. Lay the wire rectangles over the mesh rectangles to which they correspond in dimensions. There will be a ½-in. margin of mesh which should be folded back over the supporting wire. Cut the sheet iron into the sizes shown. Bend along the dotted lines, until the edges lack about 1 in. of coming together, and slip over the proper edges of the rectangles of wire and mesh. Press the sheet iron down tightly against the wire, and solder very carefully along the line where the mitered edges meet, to make a good joint.



An Easy Job of Metal Working, with Familiar Tools, Provides a Thoroughly Dependable Fire Screen at Trifling Expense, and Makes It Perfectly Safe to Leave a Fire Burning in the Grate

To join the three sections together, drill ¼-in. holes in the sheet-iron margin, as indicated, and bend some of the wire into hinges of the type shown.

The entire cost of my fire screen was $2.35—$2 for the copper screen, and 35 cents for the sheet iron and wire.—D. B. Smith, Mishawaka, Ind.

Catch Surplus Solder in Water

A certain economy may be practiced in using solder, if a basin of water is used to catch the surplus material as it falls. The disadvantage of using paper is that the solder splashes as it drops onto a resisting surface, and breaks into very small fragments, which cannot be recovered. When, however, it falls into water, it all remains in the basin, where it cools and forms into lumps which are easily preserved.

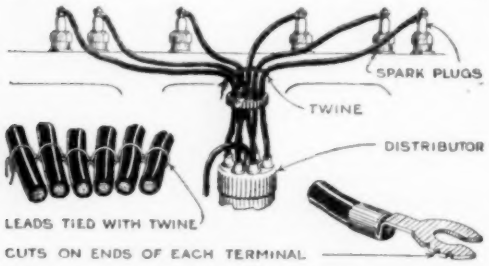
Transplanting Old Fruit Trees

To transplant a whole apple orchard, in which many of the trees have been bearing fruit for 20 years, is an undertaking which would daunt the courage of many fruit growers. This feat was accomplished, however, in one of the northern states, to avoid destroying an orchard which lay directly in the line of a new highway. All surplus foliage and twigs were first cut from each tree, so as to preserve the balance between the root and the upper part; this made it possible to abandon part of the root, but to keep enough to nourish the trimmed branches. Each tree was then dug out, with a ball of earth, about 5 ft. in diameter, clinging to the root, the remainder being cut off and left in the ground. A stone boat, equipped with a block and tackle at the forward end, was backed up to the root, and ropes were passed around the tree trunk, which had been carefully padded to prevent abrasion. The tree was thus drawn up on to the boat, conveyed to its new location, and replanted. When in position, the roots were flooded with water, so as to make the new ground unite with the ball of earth left attached to the tree, and the trunk was then mulched with straw for the winter. All the trees were transplanted in this way, and the following season they bore as plentifully as they had ever done in previous seasons, while occupying the location where originally planted.

¶For work on enameled surfaces, the rubber tip used on the end of an invalid's crutch can be fitted to the striking surface of a hammer.

Spark-Plug Leads Easily Located

When the high-tension wires leading to the spark plugs of an automobile engine are disconnected for any reason,

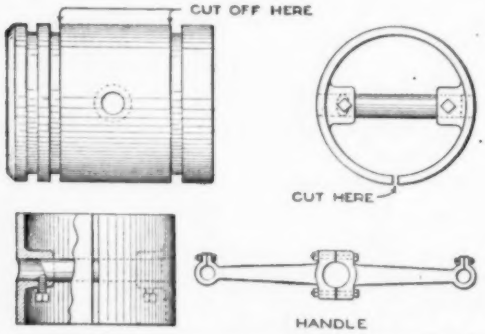


Confusion in Replacing Spark-Plug Leads may be Avoided by the Use of Either of Two Simple Methods of Distinguishing Them

some trouble may be encountered in replacing each lead on the proper plug, unless the leads are marked in some way to identify each one with its plug. Two methods of doing this are illustrated. Before disconnecting the wires, a cord may be tied around each of them, beginning with the wire leading to the plug at one end of the engine and ending with the wire belonging to the plug at the other end cylinder. The cord may then be left permanently attached, and if two or more leads are disconnected at the same time, they can be easily replaced. Another method is to cut notches in the terminals, one notch for the wire belonging to the first cylinder, two for that leading to the second cylinder, and so on.

A Tool for Fitting Pistons

It often happens that an oversize piston is too tight, even after the cylinder



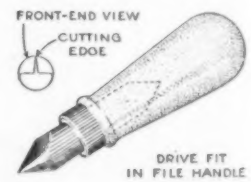
An Old Piston Forms a Tool Which Smooths Reground Cylinders to Make Oversize Pistons Slide Freely

has been reground. A tool for smoothing down the cylinder wall, to overcome this difficulty, can be made from one of the old pistons. The two ends of the piston are cut off, as the piston-ring grooves are not needed. The piece left is split down one side, as shown, making it possible to expand the tool. The expansion is controlled by a change made in the wrist pin and the lugs it fits into on the inside of the piston. Through one of these lugs, a hole is drilled and tapped for a 5/16-in. setscrew. The wrist pin is then annealed; one end is cut to form a slanting face, and in the other end a 5/16-in. hole is drilled. The pin is then hardened.

In assembly, the pin is held in place at one end by the setscrew through it and the lugs in the piston wall. When the setscrew in the lug at the other end of the pin is tightened, it presses against the slanting face, and forces the pin away from the screw, thus expanding the piston. In use, the tool is placed in the cylinder, with a handle of convenient length fastened to the wrist pin, and the setscrew is tightened until the piston makes a close fit. Then, after putting some valve-grinding compound in the cylinder, the piston is worked up and down until it moves freely. It is again expanded to fit tightly, and the smoothing continued until the new oversize pistons will fit as they should.—Edwin Schubach, Chicago, Ill.

Center Scraper for Lathe Work

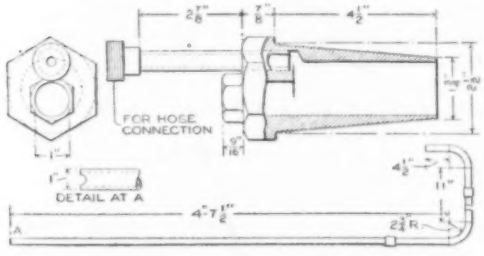
When the center hole in an arbor or shaft has been battered so that it will not center properly in the lathe, the tool illustrated will be found useful. It is merely a round piece with a 59° point turned on it, and two flutes cut out, leaving cutting edges at the sides of the taper. The tool may be made from ½-in. drill rod. It is well to make it double-ended, so that either end may be thrust into the handle, exposing the other end for use in cleaning out the shaft centers. It has been found advisable to use the 59° included angle in order to compensate for the slight rocking due to hand operation. The side of the taper which is not cut out should be very smooth, to serve as a guide for the cutting edge. All other corners should be rounded off and smoothed before the tool is hardened.—F. W. Runge, Elmira, N. Y.



Forcing Oil from a Barrel by Air Pressure

If the only hole in a barrel of oil is at the top of the barrel, it is difficult to remove small quantities of oil when needed, unless a siphon or pressure device is provided. The drawing shows a plug, to be screwed into the bunghole, which quickly provides means of applying air pressure to force the oil out. Its diameters at the ends of the taper thread, $1\frac{3}{4}$ in. and $2\frac{1}{2}$ in., enable the plug to be applied to almost any barrel. It must be screwed in pretty tightly, to minimize leakage of air.

The air hose is attached to a small pipe which projects upward from the plug, and which is provided with a suitable thread for connecting the hose. This small pipe may be screwed or driven into the plug, or may be cast solid with it. The larger hole in the top of the plug is 1 in. in diameter, and the long pipe, of 1-in. outside diameter, is thrust through this hole until its lower end rests on the



A Barrel of Oil is Emptied through the Hole in Its Head by Screwing in This Plug and Applying Air Pressure

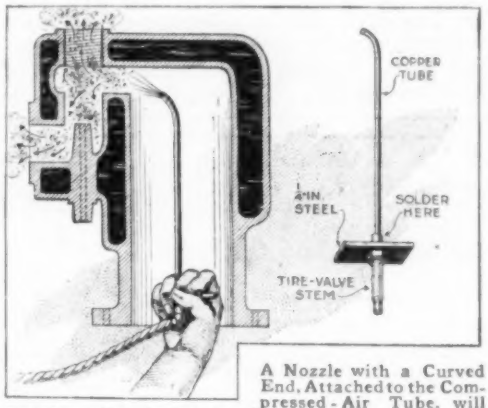
bottom of the barrel. This bottom end is cut out to enable the oil to flow into it. Above the 1-in. hole the metal of the plug projects a distance of $\frac{9}{16}$ in., in order to give additional bearing surface for the pipe. The long pipe should be a rather close fit in the 1-in. hole, so as to reduce leakage, though if there is plenty of air, a tight fit is not so essential. Even with a pressure as low as 4 to 6 lb. per square inch, the oil will flow readily.

Cutting Glass under Water

When the amateur mechanic has occasion to cut a sheet of glass, and has no glass cutter at hand, he can do a very satisfactory job with a strong pair of shears. The task can be accomplished by holding the glass under water, after making guide marks on the sheet.

Air Nozzle for Garage Use in Scraping Cylinders

Any mechanic who has overhauled a gasoline engine and scraped the carbon



A Nozzle with a Curved End, Attached to the Compressed-Air Tube, will Satisfactorily Assist in Cleaning Carbon Out of Automobile Cylinders

out of the cylinders will appreciate the little device illustrated. It is merely an auxiliary air pipe which is fitted onto the end of a compressed-air hose for injecting a blast of air into the cylinders, to rid them of the loose flakes of carbon dislodged by the scraping tools.

The air pipe is made from a piece of ¼-in. copper tube, its length depending on the depth of the cylinder to be cleaned. One end of the pipe is slightly curved, to enable the operator to force the blast of air into the valve chambers. The other end is soldered to the body of an old tire valve. A piece of steel, of convenient shape to assist the hand in holding the tube, is then threaded onto the valve stem, fastened with a nut, and soldered. This little device, which may be made in a few minutes, will save hours of valuable time on overhauling jobs.

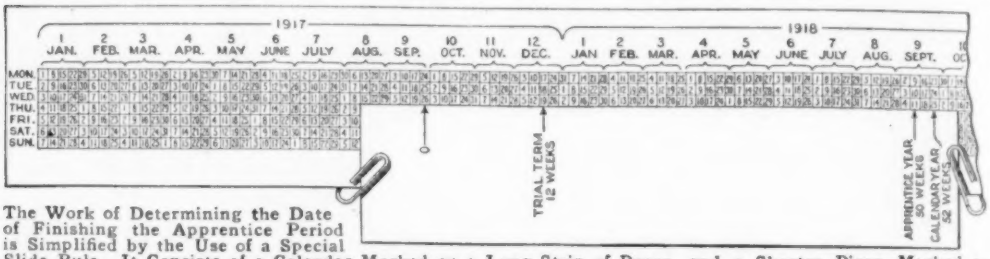
Linoleum for the Poultry House

Henhouses with walls which are not completely weatherproof can be found on hundreds of farms and in many back yards. The owners are satisfied with walls which provide some shelter but do not entirely exclude drafts, and this is a common cause of sickness among the poultry. Discarded linoleum makes a very good reinforcement for walls and roof, and, as it is very speedily attached, the poultry keeper can remedy the defect with hardly any expenditure of time or money.—J. T. Bartlett, Boulder, Colo.

Calendar Used Like Slide Rule

A man in charge of the apprentices of a large manufacturing plant found the task of reckoning the termination of each boy's apprentice period greatly simplified by use of a special calendar of his own construction, to which he attached a simple slide, marked to indicate periods of various lengths. The usual rules governing apprentices required them to put in so many years of 50 weeks each. With each boy starting at a different time, and with each boy out a longer or shorter period on account of illness or vacation, it was not easy, by ordinary methods, to tell when his year ended.

The calendar was made by numbering the days on a single strip of paper, each week running down across the strip. If a small calendar can be obtained with the numbers arranged in this fashion, the months may be pasted side by side, care being taken to fit the ends and beginnings of months together with great accuracy, so that they make full weeks. The whole ribbon covered the four years of the apprentice period, and a little more. The slide consisted merely of a strip on which was a zero mark, and three other marks, properly spaced. One showed the distance 12 weeks, the trial term, would occupy on the calendar, the next mark showed the space occupied by 50 weeks, and the last one 52 weeks.

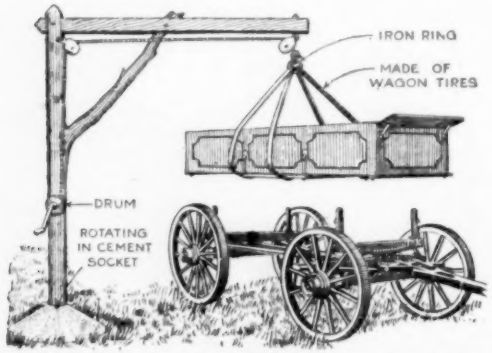


The Work of Determining the Date of Finishing the Apprentice Period is Simplified by the Use of a Special Slide Rule. It Consists of a Calendar Marked on a Long Strip of Paper, and a Shorter Piece, Marked to Indicate Periods of Various Lengths, Which Forms the Slide

To use this device to determine when a boy's year ends, the slide is placed so that the zero mark falls on the week in which the boy's year began. The 50-week mark will then show instantly in what week the end of that period falls, whereas by calculating from an ordinary calendar there is a big chance for a mistake, particularly as there are fractions of weeks on each month's page. In case the boy has been out a number of days during the year, the user of the device merely counts ahead that number of days on his calendar from the point indicated. The other periods are calculated the same way.

Crane Rotates in Stovepipe

On the farm it frequently happens, at busy times, that two or three men are called away from their work to assist in removing a wagon body from the running gear, or to replace it with a hayrack. Numerous devices are constructed for such jobs, but the one shown in the illustration, which was erected by a Virginia farmer, is certainly to be reckoned among the best.



A Handy Crane for Farm Use is Made of a Forked Tree Trunk, Thus Simplifying Construction and Giving Great Strength

The perpendicular post is a forked white oak trunk, 6 in. in diameter, with an 8-ft. crosspiece bolted to it. The four hooks are made of wagon tires, fastened to a ring made from ½-in. round iron. A stout rope is fastened to the ring by a detachable hook, and runs through pulleys down to the crank-operated drum.

By lowering the hooks and attaching them to the corners of the wagon box, a boy can easily raise the box from the gear. As the upright post is placed in a cement socket, the wagon box can be lowered to the ground and the crane turned in the opposite direction to raise the hayrack or other box. By driving

around to this side, the rack can be lowered onto the gear.

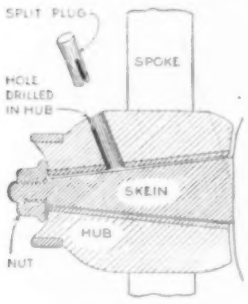
The hooks may be removed and hung against the post out of the way, leaving the derrick free for other purposes, such as hoisting a cow or pig when butchering.

To make the cement socket, a hole was dug, about 2½ ft. deep and the same diameter; a few inches of cement mixture was poured in, to cover the bottom, and left until almost set. A stovepipe was then placed exactly upright in the center of the hole, and concrete was filled in around it and built above the ground in the shape of a cone. The pipe can be removed or not, as desired.

Two grooves across the top of the cone, and a hole in the post at the corresponding height, make it possible to insert a bolt which locks the crane in any position.

Wagon Greased without Removing Wheels from Axles

By fitting the wagon wheels with grease cups, as shown in the drawing, it is possible to grease the wagon as often as necessary without removing the wheels. This is a great help in the summer when the wagons are doing heavy work continuously, and when the grease runs out at both ends of the hubs because of the heat. The grease cup is simply a 1-in. hole drilled entirely through one side of the hub. A plug of hard wood, with a screw eye in one end and slotted with a saw cut at the other end, fits into the top of the hole. It should fit tightly, the slot making it grip the side of the hole firmly. To grease the wagon, remove the plug from each grease cup, and force the grease into the holes with a stick or grease gun, such as used for autos. There is always a little space between the skein and hub, and this space is easily filled with grease by means of the grease cup. Since the method can be used when the wagon is loaded, there is no excuse for running on dry skeins.



¶A mandrel used in babbitting will come out more easily if coated with white lead.

Portable Hoist of Pipe and Fittings

A portable hoist, suitable for use in an automobile-repair shop, can be made of lengths of pipe and pipe fittings, the only tools necessary being a pipe cutter and a threading tool. Its usefulness will be demonstrated every time it is necessary to remove a motor, transmission, or other heavy unit.

A Frame to Support a Tackle Block is Made of Pipe and Fittings, and Saves the Cost of Expensive Hoisting Apparatus

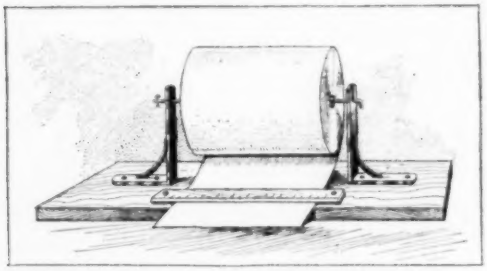
The example shown in the illustration is of the tripod type, three inclined pieces of pipe forming the legs, with three horizontal sections serving as braces for these members. The joints are made of tee connections, while ordinary floor flanges are used as feet. The portion supporting the tackle block is of the type of fitting called a "cross," and the hook that holds the chain is formed by one of the legs, which passes through the cross and is bent afterward. This makes a stronger support than a hook screwed into the cross, as the latter form of construction might cause excessive strain on the threads.

Empty Gasoline Tanks Are Dangerous

A full gasoline tank is never as dangerous as an empty one is likely to be. A little gasoline, remaining in a tank, vaporizes easily and forms with the air a dangerous explosive mixture. Therefore, if soldering or other work is to be done on an empty tank, care must be taken to keep all flames at a distance from the work.

Holder for Wrapping-Paper Roll

A grocer, annoyed by the sudden breaking of a holder for roll wrapping



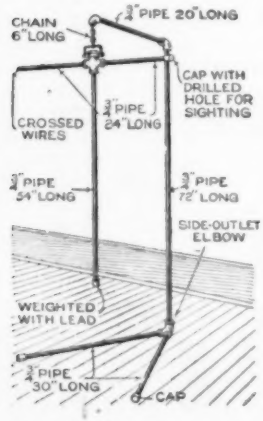
Two Shelf Brackets and a Ruler, Mounted on a Board, Form an Efficient Rack for Paper Rolls

paper, quickly mounted a substitute, shown in the drawing, and has, so far, not bought a new holder. Two light shelf brackets were screwed to a board, at about 12 in. distance from each other. The upper screw holes in the upright legs were exactly in line. Through these he slipped a light steel rod, with a right-angle bend at one end, and a small cotter pin at the other. The end of one bracket was slotted for greater convenience in changing the roll of paper.

A wooden ruler, attached to the board by screws through both ends, with washers underneath, formed a convenient straightedge for tearing off paper.

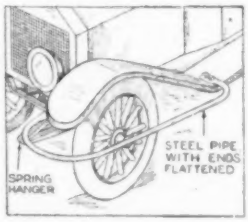
Builders' Level Made from Pipe

The builders' level here shown was made inexpensively of pipe fittings, all purchased at a plumbing-supply house. A pendulum, made of a piece of pipe, hangs from a chain, and is capped at the lower end. This lower end is partly filled with lead, and, as the chain is flexible, the pendulum is always vertical. Two other pieces of pipe are attached to the top of the pendulum on each side by means of a cross, which makes them perpendicular to the pendulum, and, as they are of equal length, they counterbalance each other, so that their horizontal position is permanently maintained. These serve as a telescope. The chain is fastened to the top of the cross by wires and a ring, the latter passing around the top of the cross just below the flange, so that a swivel joint is formed which enables the telescope to be turned easily in all directions. One end of the telescope is covered with a cap with a small hole drilled in it for sighting, and crossed wires are placed at the opposite end.—D. W. Daley, Parkersburg, West Virginia.



Safeguarding the Left Front Wheel

When a motorist had experienced two accidents by colliding with projecting hubs of trucks at night, he devised and had installed a simple guard to protect the hub of the wheel from being struck and consequently deflected to the side, with damage to the car.



The attachment was made of a piece of steel pipe, attached at the front to the horn, or spring hanger of the car, flared or bent outwardly and back, partly encircling the wheel, then fastened to the left running board.

The piping is far enough from the outside of the wheel hub to permit tire removal, the space at this point being wider than the tire, and the pipe slightly above the hub. Were an accident to occur due to striking at the side, the front end would only be pushed over, without wrecking the steering control.—G. A. Luers, Washington, D. C.

Paper Grease Gun for Emergency

To fill the transmission, or differential, case of an automobile with grease when no grease gun is available, is a task calling for some ingenuity. One motorist met the difficulty by making several cone-shaped tubes of heavy paper, the small end of each being made to fit the holes in the cases. He filled each cone with grease, placed the small end in the filling hole, and folded the paper over the grease, squeezing its contents toward the hole. In this way he crushed the cone together, and forced all the grease into the case.—Bernet S. Swanson, Chicago, Ill.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A Three-Mirror Bathroom Cabinet

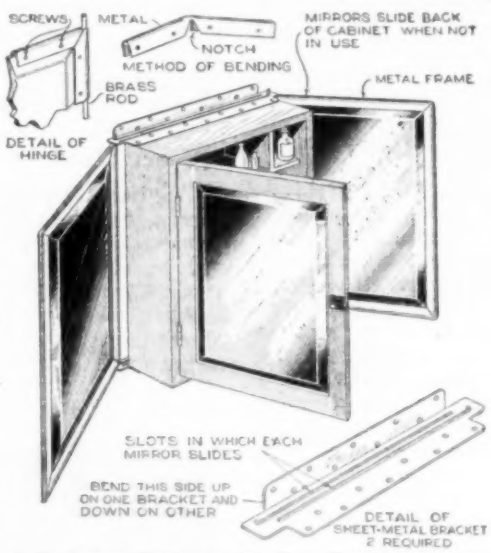
By DALE R. VAN HORN

AN improved bathroom cabinet, with the advantage of three mirrors instead of one, may be easily made at home. The chief merit of this cabinet is the fact that the two side mirrors may be put out of the way when not in use. They are so arranged that they slip behind the cabinet, and are pulled out and placed at a convenient angle when wanted.

The cabinet consists of a box of hard wood, 16 in. wide, 4 in. deep, and 22 in. high. The four or five shelves which may be provided are of any suitable ½-in. material that will work in well. These are put in place as shown, and are narrower than the depth of the cabinet to allow for the thickness of the door. The front-panel mirror, which should be a good thick one, is put in in the usual way. It may be beveled if desired.

For the two side mirrors, the same heavy weight of glass is used. These mirrors are the same size as the back of the cabinet, and are bound in heavy copper or galvanized iron. The upper details show the manner in which the glass is bound. The sheet metal is cut in strips, 2 in. wide, and bent over the edges of the glass, being beveled at the corners to fit. The two hinges consist of ¼-in. brass rods, and are 2 in. longer than the height of the mirrors. They are inclosed in the metal binding of the mirrors as shown, with 1 in. projecting from each end. The metal is finally made solid either by soldering the corners, including the brass rods, or by drilling through the side strips and the hinge and driving in small pins, soldering being preferable. Care should, of course, be taken, to prevent breakage of the glass due to heat. After soldering, a file will smooth joints before painting.

For the rest of the cabinet, two pieces of heavy sheet metal are cut, as shown in the lower detail. These are 3 in. wide, and 1½ in. longer than the width of the cabinet. To cut the slots, the best way is to bore holes at the extremities and then, with a file, scratch the outlines of the slots a number of times, until the strips of tin may be easily punched out. Holes are then bored for wood screws, and the back side bent up to fit against the wall, as shown. These strips of metal will be sufficient to hold the cabinet against the wall, but it will require a small shelf to rest upon. This may be of any material, and is out of sight.


SCREWS
METAL
NOTCH
METHOD OF BENDING
MIRRORS SLIDE BACK OF CABINET WHEN NOT IN USE
METAL FRAME
BRASS ROD
DETAIL OF HINGE
SLOTS IN WHICH EACH MIRROR SLIDES
BEND THIS SIDE UP ON ONE BRACKET AND DOWN ON OTHER
DETAIL OF SHEET-METAL BRACKET 2 REQUIRED

A Bathroom Cabinet, with Two Extra Adjustable Mirrors at the Sides, will Be Very Useful without Occupying Much Space

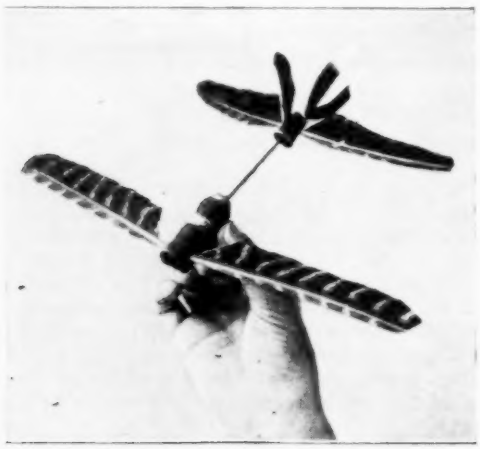
The action of the two extra mirrors is obvious. Due to the arrangement of the slots for the ends of the brass rods, it is quite easy to pull out the mirrors whenever desired, and push them back out of sight at times when the center mirror only is required.

Give the inside of the cabinet two coats of white paint, and finish the outside either in the same color, or any other to harmonize with the rest of the room.

A bathroom cabinet of the common variety may be provided with this same set of mirrors.

Airplane Glider Made of Feathers

One of the most interesting of the many types of toy airplanes now being made is the one shown in the photograph.



Feathers Which can be Picked Up in the Barnyard Form the Wings and Tail Planes of a Glider, Which, for Lightness of Wing Construction, Is Unexcelled

It consists of a number of feathers, stuck into ordinary corks and mounted on a fine sliver of hard wood, 5 in. long. The large feathers, which in this case are 7½ in. long, form the wings of the glider, and the small ones at the rear form the stabilizers. Of the three corks, the central serves as a handle for holding the glider when flying it, but chiefly as a weight to adjust the glider for balance. It should be moved forward or back until the proper position to give the best flight is found. The angles at which all the feathers are set will have to be taken care of very carefully, as it is easy to prevent the glider from working at all by simply having a little more angle of incidence in one wing than in the other. One who knows something of the shape and placing of airplane wings and tailplanes, will find the proper arrangement of the feathers with very little experimenting. — Vincent J. McMurtry, Chicago, Ill.

Leather Strips on Bicycle Tires

Cyclists who use single-tube tires of the cushion-pneumatic type may practice economy by wrapping them in leather straps; this is a dependable way of preserving them, and saves the cost of new tires. Procure some small leather straps, ½ in. in width, and join them together with small rivets, preferably of the clincher type. To make these joints smooth, taper the parts which are to overlap by slicing them with a sharp knife, thereby preventing ridges from being formed. Partly deflate the tire, and wrap the leather around the rubber until it is completely covered; then fasten the ends together with a buckle, and pump the tire up hard. The leather must be occasionally removed and cleaned, as dust and sand will work under it, but it will need no other attention. The straps for both wheels will cost about $3, but they will last for years, and will effectually prevent punctures.—Robt. C. Knox, Rogers, Ark.

Electric Bell as Nursing Aid

A convalescent recovering from a serious operation was warned by the surgeon not to lie on his back, but he constantly took that position in his sleep. Tying the body and limbs prevented him from resting, so a wood push button was fastened to a cloth bandage and strapped to his back. This made a night nurse unnecessary. As soon as the patient turned on his back the bell warned him, and thereafter he was able to go to sleep without danger.—V. H. Todd, Orange, N. Y.

Wrist Watch Seen through Gauntlet

The usefulness of wrist watches, to motorists, airmen, and others, is seriously impaired by the fact that the watch cannot be seen through the gauntlet. The method used by a California flier is to make a hole in one gauntlet, 4 in. in diameter, and cover it with a piece of heavy transparent celluloid, stitched into the leather, the hole being so located that the window comes directly over the wrist watch, and permits observation of it without admitting air or dirt to the wrist.—John E. Hogg, Los Angeles, California.

The Airman's Gauntlet is Provided with a Window through which His Wrist Watch is Visible

Photos Reproduced without a Camera

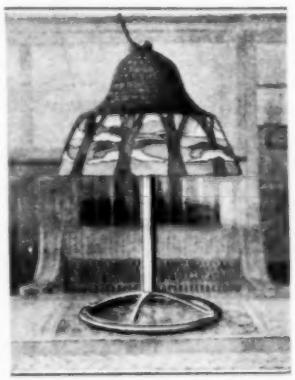
To reproduce an unmounted photograph without using a camera, place it, face downward, on a piece of contrast paper. Lay the two pieces in an ordinary printing frame, the photograph to be reproduced being next to the glass. Hold the frame in bright sunlight for a few seconds, the exact time depending on the density of the photograph, the thickness of the paper, and other factors. Then develop the print in the usual way, and if the exposure and development have been correctly timed, the result should be a clean-cut negative or reversed print. To obtain a positive, duplicate the process, using the negative instead of the original photograph.—Glen D. Bleak, Opelousas, La.

Door Knob as Faucet Handle

Those who travel a good deal are likely to be familiar with the problem of the faucet with the missing handle. In such a case the square head usually remains, but a wrench is necessary to turn it. It is often possible to find a door knob which fits the head, and it makes an excellent temporary substitute.

Lamp Base Made from Steering Post

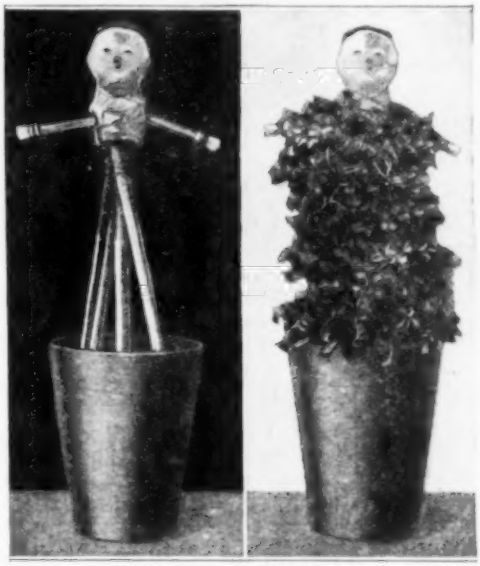
When an old worn-out automobile, with which many pleasant memories may be associated, is finally consigned to the junk heap, good use can be made of the steering wheel in the manner shown in the photograph. The wooden part of the wheel can be easily refinished, and part of the column provides an excellent standard for a table lamp. Suitable fixtures for mounting the lamp at the top of the column may be readily purchased at an electric-supply store.



When a section of stovepipe is too long to make a good fit, the superfluous part can be cut off with a can opener.

Living Plants Form Doll's Dress

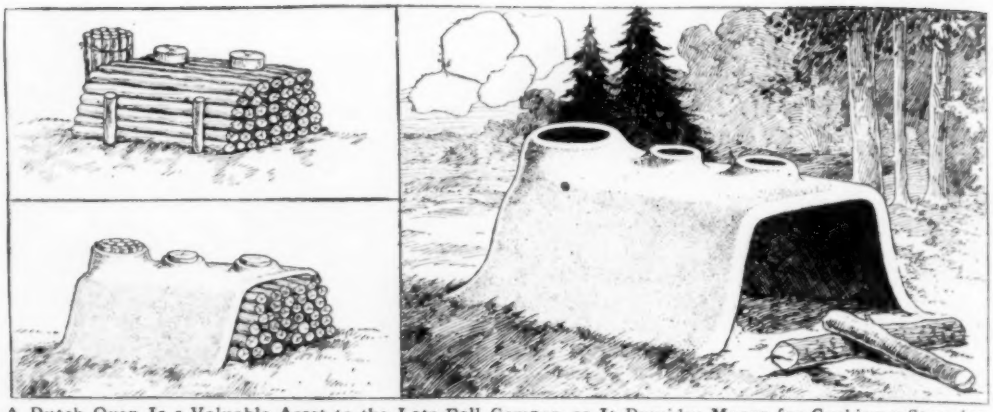
The photographs show a novel idea which may furnish amusement to those who like to grow things indoors. In a flowerpot is set a little framework of thin wood or bamboo, on the top of which are fastened a doll's head and arms. In the soil below are planted the seeds of some small flower plant or vine. Such seeds as nasturtium, morning-glory, spiderwort, and several others, are suitable for the purpose. As these little creepers grow, they are trained up the framework, and thus the doll is provided with a dress of living growth, the effect of which is quite striking and altogether novel.



Vines Growing up the Framework, Which Constitutes a Doll's Body, Provide It with a Dress of Living Foliage

Old Oilstone may be Made into a Circular Stone

An old oilstone, which was too small to be useful in the ordinary way, was cut to a nearly circular shape with a hacksaw, and a ½-in. hole was bored in it for a shaft. Mounted on a ½-in. bolt, with a pulley at the other end of the bolt and bearings between, this formed a useful circular stone. The stone was smoothed down, after it was set running, by the use of a sharp piece of steel. It was found useful for smoothing out the scratches left on metal work by an emery wheel.—R. Swan, Herman, Neb.



A Dutch Oven Is a Valuable Asset to the Late-Fall Camper, as It Provides Means for Cooking a Steaming Hot Meal. It is Made without Other Materials Than Clay and Firewood

A Dutch Oven for the Camp

The relish of food cooked in a camp over a wood fire in the open will never be forgotten by the occasional camper. Not many have tasted pastry cooked in an old-fashioned Dutch oven. This oven is first heated by building a fire in it; then, when the oven reaches the proper temperature, the fire is raked out and the food placed in it. The resulting flavor of wood smoke appeals to most campers.

The illustration shows how to form the clay for such an oven, and bake it to shape. Procure a number of straight sticks and poles, 3 ft. long, and make a pile of them as nearly square as possible, 18 in. each way, driving stakes at the sides to hold them in place. At the end of this pile, stand a bunch of the sticks on end, making the bunch round and about 8 in. in diameter. The sticks can be tied together with a stout cord, or with a twisted rope made of hay.

On top of the main pile, place one or two pieces of wood, cut from a log or limb of a tree, 6 or 8 in. in diameter; these are to form holes in the clay top.

When the poles are built up as described, they are ready for the clay covering. The clay must be selected with care, as much depends on the quality and the mixing. A hillside may produce the right kind, either blue or yellow. Mix this to a paste with water, and apply a coat over the wood, about 2 in. thick, covering it with earth, except the front end of the sticks, the top of those standing vertically, and the wood blocks. After the covering is completed, the oven is ready for firing, which is done by removing the large pieces of wood from the holes in the top, and building a fire under the sticks inside the oven.

In cooking, this furnace may be used as a stove or a Dutch oven. A trench is dug on the inside, over which green limbs, or iron bars, are placed like a grate, to hold the burning fuel. When using it for a Dutch oven, a fire is made in it and kept burning until the walls are thoroughly heated; then it is raked out, and the food to be cooked is placed in it. The oven should be quite well sealed during the cooking period.—Charles R. Fisher, Chicago, Ill.

Indirect Illumination Provided

Any person who suffers from weak eyesight is at a serious disadvantage if he is obliged to do much studying by artificial light. When not so engaged, he should rest his eyes by avoiding strong illumination, and where an incandescent droplight is used as a reading lamp, with an ordinary conical shade, it is possible to obtain a subdued light by hanging the shade upside down, so that the light is reflected from the ceiling, instead of coming directly from the globe. To make this adjustment, punch small holes around the rim of the shade, fasten a short string to each hole, and tie all the strings together in such a way that the knot will be the same distance from each hole. Tie a cord to the knot, and pass it through a screw eye fastened to the ceiling about 2 ft. from the upper end of the lamp cable, allowing the free end to hang down. Pulling the cord inverts the shade, so it will hang evenly, with the globe in a vertical position.

Repairing a Worn Wire Grip

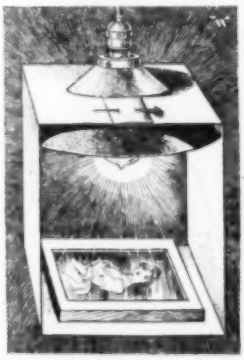
When a wire grip refuses to take hold of the wire, the job may be finished by slipping an old flat file into the grip with the wire. The teeth of the file are held against the wire by the clamp, and hold perfectly.

Restoring Gloss to Straw Hats

A straw hat which has been cleaned with chemicals does not always retain its original gloss after the operation. Coat the hat with a thin solution of white shellac after it has been cleaned and dried, and the glossy appearance will be restored.

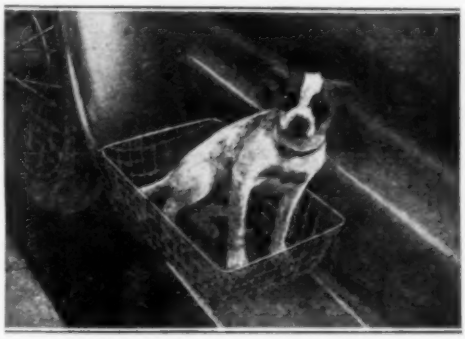
Suspended Printing Frame

The amateur photographer works at a disadvantage when printing, if he is obliged to use a light suspended from the ceiling by a short cord. An extension cord will relieve him of the fatiguing work of holding his frame near the globe, but it will not guarantee that the distance between the source of light and the frame will be constant. This condition is important, however, and a dependable expedient is shown in the sketch. Cut a long piece of stiff cardboard, a little wider than the frame, and fold it as shown, so that it forms a box with two of the sides open. Lay it out flat again, and cut a segment of a circle from each end. It will be noticed in the illustration that the conical lamp shade passes through the opening formed, after the ends have been joined together at the top. It is necessary, therefore, that each segment should be more than a semicircle, so that sufficient board will overlap to provide material for fastening the ends together. Both segments should be scribed with the same length of radius, so that they will fit the conical shade at the same distance from the apex. If the pins or wires which secure the ends are 2½ in. long, or more, the cardboard is not likely to buckle at the top, or to lose its rigidity.—Hugh N. Anderson, Ste. Agathe des Monts, Quebec.



Running-Board Dog Carrier

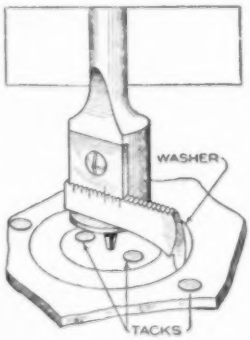
While some dogs may sit quietly on the running board of a car speeding over rough roads, the addition of a wire basket will provide safety against an accident to the dog as a result of an extra-violent road shock. The basket may be readily fastened to the running board with staples or loops of wire.



People Who Like to Have a Dog on the Car, but Have No Room for Him, may Find the Running-Board Wire Basket Convenient

Washer Cutter Made from Old Expansion Bit

When the lip on the body of an expansion bit is worn off, or the worm has been blunted, the tool is too often thrown away. It can be easily made over into a tool to cut disks and washers. All that is necessary is to grind down the cutter and the remains of the body lip, and to file the worm to a smooth, round point without making it sharp, so that it will revolve in the material which is to be cut, but will not penetrate it. Soft metal, leather, fiber, and similar substances, can all be cut with this tool. When disks are to be cut, the material is tacked down in two or three places just outside the periphery, but if washers are to be turned out, the center portion is tacked down and the outside circle cut first, the washer being held in this way until the complete inner circle has been cut.—Henry Simon, Laguna Beach, Calif.



AIR-PROPELLED SLEDS AND ICE BOATS

By F. W. Ranston

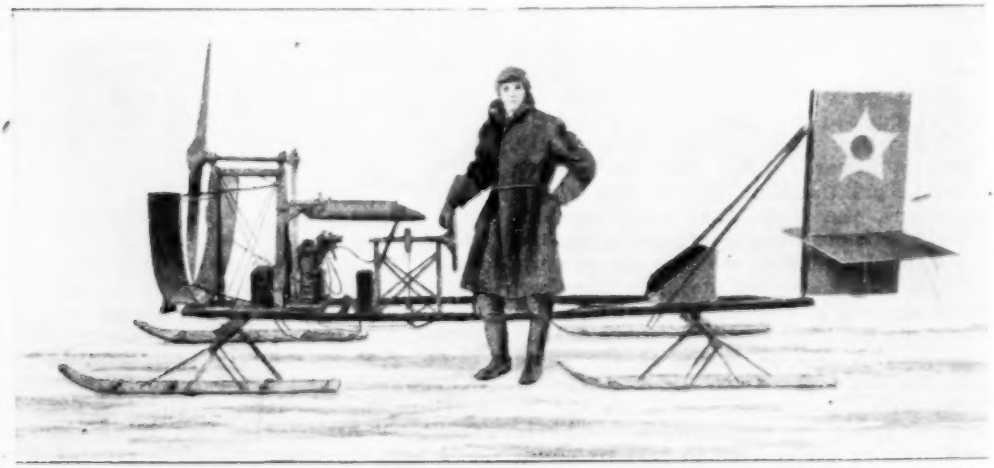
NOT the least of the contributions which aeronautics has made to other branches of engineering is the application of the air propeller to transportation over ice and snow.

An attempt will be made here to describe very briefly several types of air-propelled vehicles traveling on skis or runners. All of these are homemade, using ordinary motorcycle or automobile engines, and designed merely for carrying one or two persons, at a rather high rate of speed. In the case of the first outfit illustrated, the features of the construction will be described in considerable detail; the others are illustrated chiefly as presenting suggestions to those who may prefer a construction a little different from that of the sled in the photographs on this and the next page.

This first sled embodies many airplane features besides the propeller; it is designed for travel over either snow or ice. The making of it calls for parts that can be taken from a motorcycle which might otherwise be merely laid up for the winter. When summer returns, the parts can be restored to the motorcycle, or pontoons can be substituted for the runners, to form a hydroplane.

As seen in the drawing, the frame is made of 1 by 2-in. yellow pine, and the outside is reinforced with ⅛ by 2-in. band iron, bolted to the side. This forms a frame which is stiff as well as tough. At the rear, the frame members will have to be brought together, as shown, and attached to a block; to get the wood to bend to the curve required, it will be necessary to steam it or soak it in hot water.

The runners are made of ½ by ⅛-in. ash, 5 ft. long. They are provided with cleats to prevent whipping. The ends are steamed and bent to an angle of approximately 45°. The bottoms of the runners are covered with No. 18 or 20 gauge sheet steel. In the center of each of these wide runners is a ¼ by ½-in. sharp steel runner, welded to the center of the sheet-iron bottom. The runners are supported by brackets which swing

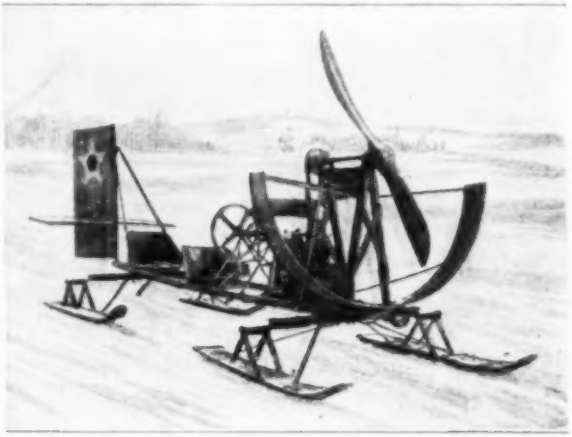


Built along Strictly Aeronautical Lines, This Machine Embodies Lightness and Speed Together with a Considerable Degree of Safety. The Sled is Steered by the Use of an Air Rudder as Well as through the Front Runners

around the ends of the front axle, enabling them to remain in contact with the road, even if the surface is irregular. The front axle is pivoted to the center of the frame for the spring. The steering gear consists of two wheels, pressed and riveted to a 1-in. steel pipe, one of which is an automobile steering wheel and the other a pulley, to take a ⅛-in. stranded steel cable. The shaft or steering column is supported by a bracket made from band iron. The cable is fastened around the pulley, and run through two smaller pulleys to the ends of the front axle. A turnbuckle is provided in this steering cable to take up slack whenever it develops. To the rear of the frame are applied two rudders, one vertical and one horizontal. They are attached by means of an upright piece of hard wood, supported by two similar pieces reaching in a slanting direction to the sides of the frame. The vertical rudder is connected, by cables along the frame, to the pulley on the steering column, so that the rudder turns in a direction corresponding to that in which the front runners are turned. The air rudder is found to be of assistance in steering when traveling at high speed on ice. The horizontal rudder is adjustable, so that the rear end can be elevated slightly when traveling without a passenger. The rudder thus helps to prevent the pull of the propeller from lifting the rear runners off the ice.

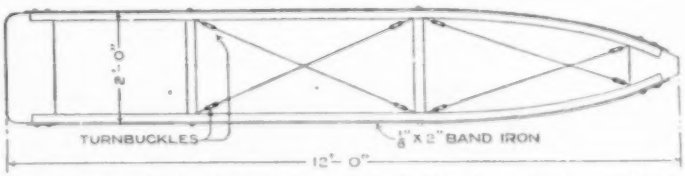
The propeller used is 5 ft. in diameter, and is shaped to a pitch of 4 ft. It is made of pine boards glued together, and is 4 by 6 in. in cross section before carving. It is mounted on a bracket made of yellow pine, which is bolted to the front of the frame. A number of ⅛-in. stranded steel cables with turnbuckles at the end are run from the top of the propeller bracket to the frame, to prevent the vibration from loosening the fastenings of the bracket. The propeller is bolted to a flange at the end of a 1-in. shaft, supported on the bracket by two bronze bearings.

The engine is laid on a bed made of angle iron, and provided with steel brackets to accommodate the particular shape of the engine used. The brackets are provided with an up-and-down adjustment which raises or lowers the engine to take up slack in the chain. The driving sprocket on the rear wheel of the motorcycle is removed and bolted to a flange at the rear end of the propeller shaft, being kept in line with the sprocket on the engine. The chain is then applied, giving a speed ratio of about 1½ to 1.



Another View of the Airplane-Type of Sled: The Propeller Guard Is a Feature without Which No Such Vehicle can be Considered Safe to the "Innocent Bystander"

A gas tank is hung above the engine, being supported by a brace bolted to the propeller bracket at one end and to the spring bracket at the other. The oil tank is kept within reach of the driver, so that he may pump oil into the crank case while in motion. The throttle on the carburetor is controlled by a steel wire, brought through the steering shaft and fastened to a lever on the steering wheel. The advance lever on the magneto may be controlled the same way, if desired.

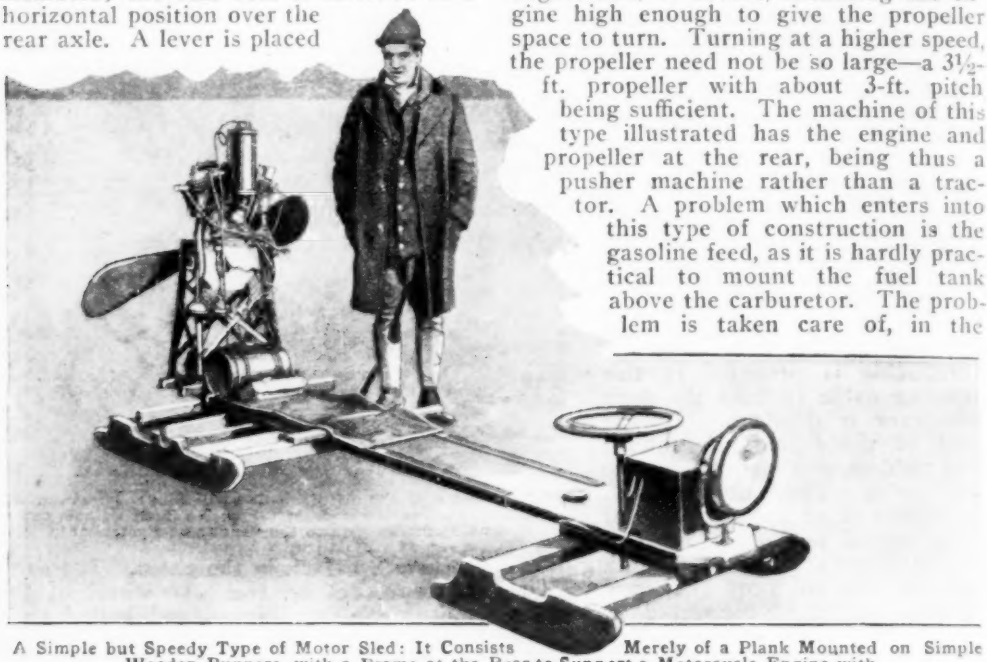


The Frame is Made of Band Iron, Bolted Directly to Strips of Wood, Which Give Stiffness. It is Held Together by Wires with Turnbuckles

A propeller guard, made of sheet steel reinforced by rolling the edges about a steel rod, is mounted at the front. It is bolted to the frame and braced to the propeller bracket.

The seats are made of galvanized iron, having a wooden base upholstered with imitation leather. The driver's seat is

tilted back and hung between the frame members; the rear seat is fastened in a horizontal position over the rear axle. A lever is placed within reach of the driver's foot, connected by a steel cable to a drag hook hung under the rear axle, which acts as a brake when required. A headlight is attached to the front of the frame, operated by a storage battery, which may be mounted whenever night driving is contemplated.



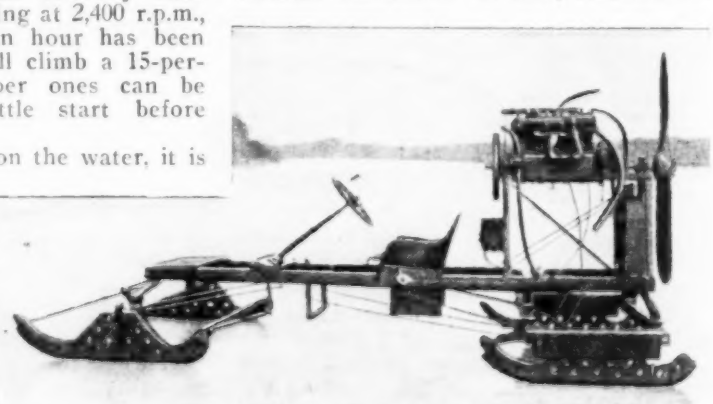
A Simple but Speedy Type of Motor Sled: It Consists Merely of a Plank Mounted on Simple Wooden Runners, with a Frame at the Rear to Support a Motorcycle Engine with Propeller Directly Attached

The engine is started by turning the propeller in the same manner as an airplane engine. With an ordinary twin motorcycle engine turning at 2,400 r.p.m., a speed of 55 miles an hour has been obtained. The sled will climb a 15-percent grade, and steeper ones can be negotiated with a little start before climbing.

To use the machine on the water, it is only necessary to remove the runners and replace them with pontoons, which can readily be made by covering a light but substantial wooden frame with sheet metal.

A somewhat simpler type of machine can be made by mounting the propeller directly on the crankshaft of the engine and, of course, mounting the engine high enough to give the propeller space to turn. Turning at a higher speed, the propeller need not be so large—a 3½-ft. propeller with about 3-ft. pitch being sufficient. The machine of this type illustrated has the engine and propeller at the rear, being thus a pusher machine rather than a tractor. A problem which enters into this type of construction is the gasoline feed, as it is hardly practical to mount the fuel tank above the carburetor. The problem is taken care of, in the machine illustrated, by the use of a vacuum-feed system. A speed of 50 miles an hour on smooth ice is claimed for this sled.

A machine somewhat similar in type, but heavier and more powerful, is shown in the last photograph. It shares with the preceding one the features of direct drive from the engine to the propeller and of consequent freedom from transmission difficulties. It also, to some ex-



A Heavier Type of Sled: Driven by a Water-Cooled Engine Taken from a Light Automobile, It Avoids the Use of a Chain Drive, but Has the Disadvantage of a Heavy Engine Placed High in the Air

tent, has the disadvantage of being rather top-heavy, and this must be taken care of by placing the runners far apart and avoiding the turning of very sharp curves. The automobile engine used is an ordinary water-cooled one, of about 25 hp. It is mounted on a skeleton frame with the radiator below the crankshaft, just ahead of the propeller. Thus the propeller, in drawing back the air, forces it directly through the radiator, giving quite effective cooling. The frame is mounted on elliptical automobile springs. On this sled, the runners are made easily demountable, and two sets are provided, flat ones for use on the snow and a beveled set for ice running.

As to which of these types is to be preferred by the amateur mechanic who wishes to build a motor sled, this depends largely on what kind of an engine he can get hold of; whether he gives first importance to safety of operation or to ease of construction, and other questions of this nature. The first sled described possesses the great advantage of lower distribution of weight—an engineering feature which contributes to safety from accidents. The propeller guard is another great safety feature. The second sled is perhaps the simplest type in construction, but the engine will need to be well-braced, or something will be sure to rattle loose. If a larger water-cooled engine is available, and it is not easy to procure a suitable chain drive, the type of construction in the last photograph may be almost inevitable. If the tread or the distance between the runners is then made great enough to counteract the top-heaviness, and if the runner construction is made strong enough to take care of this extra width, there is no reason why the sled should not be safe.

To Preserve Shoe Soles

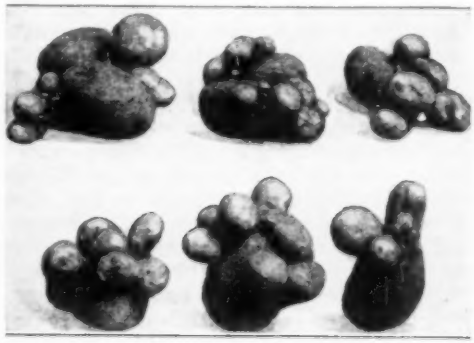
An old method of preserving leather may be useful in these days when shoes wear out so rapidly. A thin varnish is applied to the leather—two coats with a short interval between them, and a third one after these have thoroughly dried. If this is done every two weeks to the soles of shoes, their wearing qualities will be much improved and a saving effected while high prices prevail.

Old Tires Prevent Rattle in Car

Whenever an automobile is overhauled periodically—whether once a year or oftener—a very economical method of reducing vibration in the chassis, engine, and body, consists in placing gaskets of rubber between the bolted surfaces, the gaskets being cut from sections of old tires. The elasticity of the rubber remains effective for about a year; but, to get the full benefit of the cushioning effect, the gaskets should be renewed every time the car is overhauled. Among the places where they are of service may be mentioned the spring seats on the axles, where two thicknesses of rubber should be placed, if the car is a heavy one. This prevents road shocks from being transmitted directly to the frame. Similar pieces should be placed below the engine lugs, before these are bolted to the frame, so that the rubber will deaden the hammering of the explosions. Gaskets should also be placed under the transmission lugs, to diminish the vibration caused by bringing the gears into mesh. Other places to use the rubber gaskets are the supporting arms of the radiator, and the ledges of the body and engine hood.

Winter Crop from Old Potatoes

Old potatoes that are left at the end of the summer may be used to raise an indoor crop, no matter how shriveled they may be. Place them in a little dry soil in a dark cupboard, or cellar, and leave them. In a few weeks they will start to sprout, and the small potatoes can be gathered when they are about as large as walnuts. The old potatoes will go on bearing through the greater part of the winter, until there is nothing left of them but dry skins.



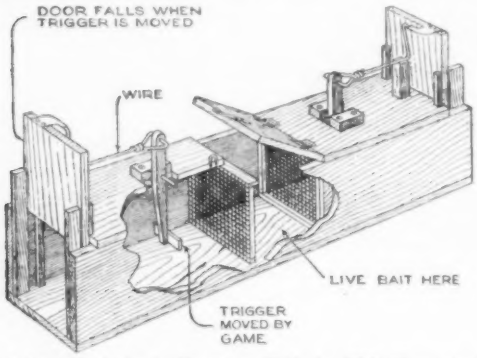
Old Tubers Which are Left at the End of a Season can be Used in a Peculiar Form of Indoor Potato Culture

Sounding Board for Electric Bell

If an electric bell is mounted on an old cigar box, with an S-shaped slot, about ¼ in. wide and 3 in. long, cut at each side, the loudness of the sound will be greatly increased. The box acts as a sounding board, and thus enables a small bell to be heard all over a moderate-sized shop or warehouse.—H. A. Barwick, Shawinigan Falls, Quebec.

Trapping with Live Bait

An animal that would otherwise pass by a trap, will stop to investigate the



A Live Chicken is Used as Bait in This Trap, but is Protected by Wire Netting from Attack by the Animal When Trapped

scent of a live chicken, or other live food that suits its taste. Skunk, opossum, and even the wary mink, may be caught in this way. The trap should be made double, with a cage for the chicken in the center. Take four boards, about 8 in. wide and 4 ft. long, and nail them together in the form of a long box open at both ends. Before the top board is nailed on, however, put in two partitions of strong, close-meshed wire netting to form a cage for the chicken. Also saw out and hinge a short piece of the top board to make a door through which the fowl can be put in and taken out. Doors in either end of the box slide up and down between cleats nailed to the sides, and are held open by a simple trigger.

The fact that the prowling animal can glimpse daylight through the box leads it to venture in without suspecting a trap. Once inside, it is sure to touch the trigger, which releases the door and lets it drop down, closing the entrance. There is no reason why another animal may not enter through the other door, making a double catch. The chicken will be perfectly safe, as the animal cannot enter its cage. Furthermore, an animal will usually lose all appetite for the bait when it finds that it has been trapped.

The nature of the catch can be determined by looking through the hole in the top of the box. Unless it is desired to take the animal alive, it can be drowned by holding the trap under water. This should always be done with a skunk. The trap will prove more effective if a little light brush is spread on top of it. The doors should be arranged to close securely, and, if necessary, weighted. A strip of tin, tacked along the lower edge, will prevent the animal from gnawing out.

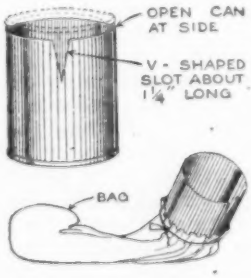
A somewhat similar form of box trap has no cage, but is divided in the center by a screen of wire netting. This trap is baited with apple, cabbage, or turnip, and will likely catch a rabbit. Should a mink or a skunk come along, it will probably try to get at the rabbit from the other side of the wire screen, and be caught in the other end of the trap. A set of this kind will be more apt to get a mink if the rabbit is left in the trap over the second night.

Rubber Bands Help Glue to Bind

When an article of furniture is being glued, the permanence of the job does not depend entirely on the quality of the glue. Attention should also be given to the method of holding the glued parts together until the glue dries. Wherever it is possible, use strong rubber bands. The tension is steady, and they can be used over again many times.

Can for Gathering Clover Seed

Gathering sweet-clover seed by hand is a tedious task, even when the patch of land is quite small. To save time, use an ordinary fruit can, with a slot cut in the side, as shown—and if a large quantity of seed is needed, cut a large hole in the bottom of the can, and attach a bag to catch the seed as it falls through. When using it, catch the stalk in the slot, with the head inside the can, and pull outward. The edge of the slot will detach the seed, which will fall into the can.

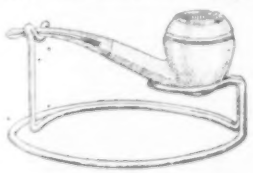


Tool Case from Tire Tube

A handy pouch for small emergency tools can be made from a 12-in. section of an old automobile inner tube, and can be carried in the door pocket of the car. At one end of the piece of tube, cut away sufficient rubber to leave a corresponding flap, about 1½ in. long. Fold the flap over, and cement it, so as to close the entrance to the tube at that end, forming the bottom of the pouch. Then make a similar flap at the other end, about 3 in. long, to form a cover, which may be secured by a button stitched to the rubber. To keep the tools from striking together, separate compartments can be made by making vertical stitches, which hold the front and back together between the compartments.—Y. K. Stoddard, San Diego, Calif.

Stand for Tobacco Pipe

A convenient stand, or rack, for holding the smoker's pipe in an upright position when not in use, can be made by bending a single piece of wire to the shape illustrated. Stiff steel or hard-brass wire should be used, and the shape should be patterned so as to bring the weight of the pipe well inside the circular base. The rack can be nickelplated at small expense, if desired for permanent use.—Wayne W. Leyrer, Atlantic City, N. J.

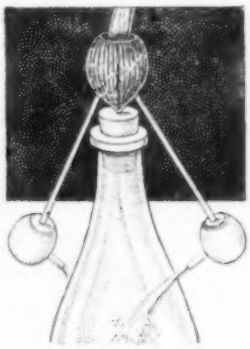


Tray Made from Embroidery Hoop

With a few glass push pins, an embroidery hoop, and a piece of leather, silk, or other material, an ornamental tray can be made, suitable for use on a dressing table. The material is stretched over the outer hoop, and gripped by the inner hoop in the usual way, but before placing it in position it should be carefully cut to such a size that no part of the edge will be visible when the inner hoop has been adjusted. Then thrust the push pins between the hoops, to serve as legs for the tray, and, if desired, add a little painted decoration.

A Curious Water Mill or Turbine

The toy mill here shown is operated by reaction of streams of water. The only materials necessary are some wheat stalks, a corked bottle, two hazelnuts, and a walnut with a sharp point at one end. Break the walnut open at the end remote from the point, remove the kernel, and bore a hole in each side to admit the ends of two pieces of wheat stalk, about 4½ in. long. Then bore two holes in each of the hazelnuts, one at the top and one at the side. Remove as much of the kernel as possible from the interior of each nut by thrusting a needle, or a piece of wire, through the holes and scraping the nut on the inside. When they have been fairly well hollowed out, fit them onto the ends of the long straws, and put straws, about ½ in. long, into the holes at the sides. Then place the point of the walnut on the cork, balancing it so that the long straws hang down on each side of the bottle, with the short straws pointing in opposite directions.



To operate the mill, pour a steady stream of water into the walnut. The water will run down through the long straws into the hazelnuts, and out through the short straws; and the two outflowing jets of water will cause the apparatus to revolve rapidly as long as the stream continues to flow.

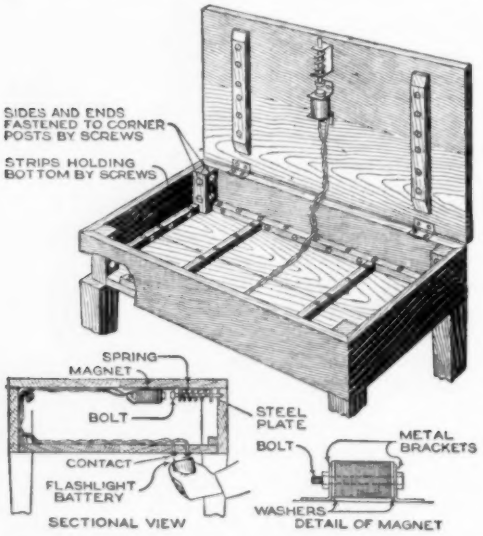
To Protect Unexposed Photo Plates

When opening a box of camera plates, cut the outer one in two at the center of the longest dimension, instead of cutting the paper and opening it as usual. This leaves the outer box somewhat like a playing-card box, the two halves slipping over the ends of the inner box. The plates will thus be prevented from being accidentally exposed, which may occur if the inner box drops out when lifting off the cover of an ordinary outer box.—A. Handelman, Montreal, Canada.

¶When trouble is encountered in putting on a tight belt, try a piece of sandpaper between the belt and the pulley.

Flash-Light Battery Forms Key to Electromagnetic Lock

Most people have use for a place to store articles where they will not be disturbed by unauthorized persons. Any ordinary cabinet requiring a lock and key will, of course, do, but the table-top



The Table Has a Hollow Compartment Which Is Quite Inaccessible Except by Applying a Small Electric Battery as a Key

cabinet, opened by electricity, is novel as well as practical, and safer.

The cabinet itself is part of the table. But it should be built so that there are no screws or nails that may be drawn to open the box. The drawing shows how such a cabinet is put together. The legs of the table serve as corner posts. The sideboards are screwed to these posts, but the screws should be started from the inside, leaving no heads showing on the outside of the cabinet. The bottom is fastened to strips screwed to the sides, all screws being started from the inside, as before. The top is made up of several pieces, fastened together by cleats on the underside. It should be hinged on the inside, as shown.

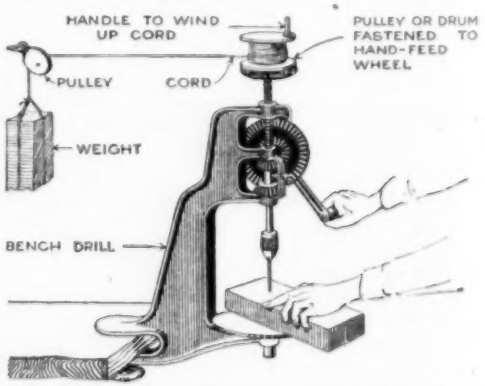
Means of locking and unlocking the cabinet are provided by a magnetic latch. Between the ends of the bracket, the bolt is surrounded by a light coil spring, one end of which is run through a hole drilled in the bolt. The head of the bolt, at the other end of the bracket, forms the armature of an electromagnet. This magnet, consisting of six layers of No. 24 magnet wire, wound on a 1½-in. bolt or machine screw, serves to unlock the cabinet. The wires making connection with the magnet are led to the bottom of the box, and are there soldered to two pins, or fine nails, which are driven into the bottom of the box, and thus out of sight. Where the wires cross the hinged edge of the top, they should be left loose, with a little wire in a free loop, so that they cannot be damaged by opening the lid. Insulated staples may be used to hold the wire to the wood.

The cabinet may be finished as desired, but care should be taken to remove the finish from the pin or nail heads on the bottom of the box, so that they will make good connection.

To unlock the cabinet, hold the spring contacts of a flash-light battery against the pin or nail heads, as shown in the drawing. This furnishes current to the magnet, which pulls back the bolt, thus allowing the lid to be raised. If it is desired to make a spring lock, proper shaping of the steel plate into which the bolt fits will accomplish this result.—J. Horace Van Nice, Waukon, Ia.

Workman Uses Bench Drill Fed by Hanging Weight

The advantage of the drill here shown is that it is fed by means of a weight, so that the operator's hands are free to hold the work and turn the crank. It can be stopped at any point by giving the cord a couple of turns around the chain, or hook, which holds the pulley. By changing the weight, the power applied to the feed can be varied, and drill sizes from ⅛ in. to 1/32 in. have been used with complete success.—Wesley S. Malloy, Whitefish, Mont.



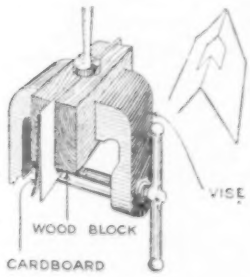
A Hanging Weight Feeds a Bench Drill, So That the Operator may Insure Accuracy by Holding His Work with One Hand

Sun's Heat Runs Steam Engine

In the course of a series of experiments made to demonstrate the effect of lenses in concentrating solar heat, three lenses collected sufficient heat to drive a small steam engine. They were arranged at equal intervals around the vertical cylindrical boiler. As the heat from the sun could pass directly through only one of them to reach the boiler, it was reflected through the other two by mirrors. It was necessary, of course, to place each of the mirrors at a certain angle to the path of the heat waves from the sun, so that they would be reflected through the lenses, and to adjust each lens in such a way that the heat passing through it would reach a focus on the boiler. The three focal points were thus arranged at equal intervals, to insure uniform heating of the water. In this experiment, sufficient power to run the engine was obtained in six minutes; but the number of mirrors can be multiplied indefinitely, as long as there is room to set them up without obstructing the light, so that the time taken to boil the water may be considerably reduced.—Philip A. Wall, Bedford, Mass.

Square Hole Made with Round Bit

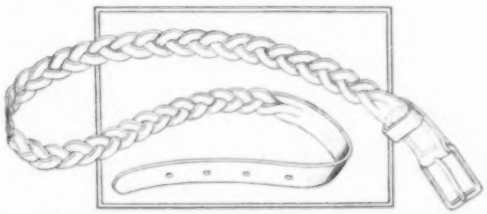
One may safely wager that he can bore a square hole with a round bit, provided the material to be bored is left out of the agreement. The illustration shows how the trick is done. Fold a piece of paper, or cardboard, and clamp it between two blocks of wood in a vise. The bit should be one of the type used for making blind holes with flat bottoms in wood—an auger without the guide screw, or a twist drill ground nearly straight across. Bore down a distance equal to half the diameter of the bit; when the cardboard is removed, it will have in it a square hole made by a round bit.—Edw. H. Davis, Philadelphia, Pennsylvania.



The price of a razor strop can be saved by using a piece of newspaper folded to a width of 2 in. The porous surface offers sufficient resistance to the blade, and the printer's ink acts as a lubricant.

Braided Leather Belt

By proceeding as follows, it is not difficult to braid an ordinary leather belt without cutting the strands apart at either end:

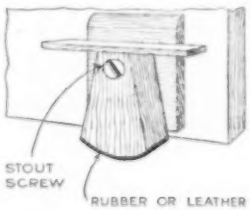


The Braiding of the Belt may Look Impossible, but It is Easily Accomplished as Described

Cut the central part of the belt into three strands of equal width, beginning a few inches from the buckle, and ending the same distance from the last hole. Fasten the buckle to a hook, and begin braiding the strands. After about 6 in. has been braided, it will be necessary to untangle the free end of the belt. This is done by holding the braided part of the belt in the left hand, while the right hand passes the free end through the cuts. The belt should be braided very tightly. The last time the free end is untangled, it will be impossible to do any more braiding. Then loosen the strands, allowing them to take up the portion remaining unbraided. The edges may be colored with shoe polish, if desired.—Tod Masters, Fort Atkinson, Wis.

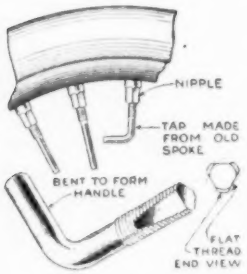
A Simple Doorstop

A doorstop which is easy to make, and which will hold the door in any position, even if the floor is somewhat uneven, consists of two or three blocks of wood fastened by a few small nails and one large screw. The curved surface at the bottom is made eccentric, so that, as the block is rotated by the foot around the screw as a pivot, it will bind against the floor, or be released from it, depending upon the direction in which it is rotated. The large block, attached to the door, serves merely to give a longer bearing to the screw, which is essential, as the strain upon it when in use may be considerable.



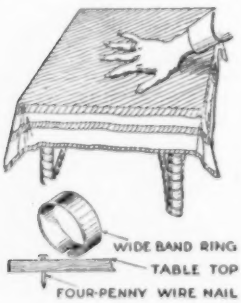
Nipple Tap Made from Old Spoke

When replacing a broken wire spoke in an automobile wheel, it is sometimes difficult to screw the new spoke into the nipple, owing to rust and accumulated dirt; and if force is used, another broken spoke may result, or a damaged nipple, which means removal of the tire while a new nipple is being screwed in. This trouble can be avoided by making a tap out of an old spoke, provided the threads are still fairly good. File three flats on the threaded portion, an equal distance apart, as shown in the sketch, and cut off part of the spoke to form a handy tool, after bending the end to make a handle. This will make an excellent cleaning tap, and can be used several times before it becomes dull.—D. Welge, Mason, Nev.



A Simple "Spirit" Table Levitation

Spirit effects always create interest and mystery. A simple table-lifting effect can be produced at home with little preparation. A small, light stand will be required, a wicker flower stand being suitable. Drive a four-penny wire nail into the center of the top, so the under part of the nail head has about 3/16 in. clearance above the table. Touch a little black paint to the part of the nail above the table top. A woven-wool or tapestry cover should then be thrown over the top. Get a wire band ring; a "gold-filled wedding-ring" can be bought for 10 or 15 cents. File a notch in this, so the head of the four-penny nail will hook into it. Put the ring on the "ring finger" with the notch underneath.

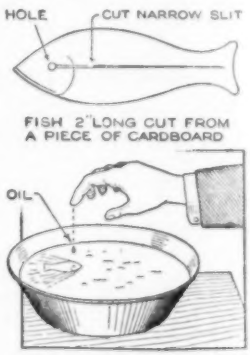


The operation of the trick is as follows: Rub the hands over the surface of the stand to "magnetize" it. Under cover of these motions, work the nail head through the strands of the stand cover. Then hook the nail head into the notch of the ring. Spread the fingers out, and continue motions with the other hand to add mystery. Then take away the free hand and lift the stand slowly. Act slowly, as though uncertain of the "magnetism"; it will divert attention from thoughts of mechanical aid. After lifting the stand, let it down slowly. Then "demagnetize" it. This gives opportunity to pull the cover over the nail again, although it will not show if the audience is a few feet away. Do not let the spectators see the palm of the hand that wears the ring, or they will discover the notch.

A heavier table can be lifted by having a ring for each hand and two nails spaced properly on the table, although the one-handed table lifting is just as effective.

The Trained Pasteboard Fish

The swimming fish is a pretty trick to perform for a small company. Cut, out of cardboard, a fish about 2 in. long, and make a hole, about the size of a small drop of water, where the eye of the fish would be. Cut a very narrow slit from this hole to the middle of the fish's tail. The fish should be of orange, or some other bright color, so as to show plainly in the water. The trick is done as follows:



A large shallow pan of water is placed on a low box; the fish is put into the water so that its tail nearly touches one end of the pan; the performer then announces that when he beckons, it will swim toward him. He holds his hand over the fish an instant, then stands back and beckons to it, using some nonsensical formula when doing this.

The secret of the trick is that, unknown to the spectators, the magician lets a drop of oil fall from his finger into the hole in the fish's head; and, in spreading over the water, the oil forces itself out through the narrow slit and pushes the fish along.

If observers see the drop of oil fall, they will probably think it only a drop of water, especially if the performer waves his hand about a little when putting the fish into the pan.

Chewing Gum as Repair Cement

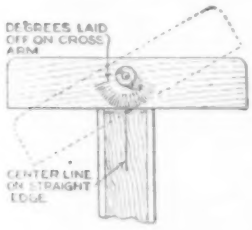
A motorist had trouble with the control lever of his car, the knob of which had worn loose. The threads inside the composition ball had become stripped, and on rough roads it was sometimes shaken off the lever. To tighten it, a wad of chewing gum was thrust into the hole in the ball, after which it was screwed on to the lever, and made a tight fit when the gum had hardened.—Frank W. Roth, Joplin, Mo.

Newspaper Rack under Mail Box

Mail boxes, such as those used at the entrances of apartment houses, are usually not large enough to accommodate packages. A convenient and not unsightly addition to a row of these boxes is a rail made of ¼-in. round brass, or plated steel, running below the boxes, about 1 in. from the wall, with the ends bent in and fastened to the wall. Such a rod forms a convenient receptacle for many small packages which may come through the mail.

A Bevel Protractor on a T-Square

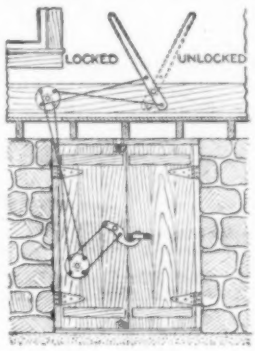
An ordinary wooden T-square can be used also as a bevel protractor, in the manner illustrated. First, remove the cross arm and attach it to the straightedge with a bolt and spring washer. Mark off the degrees of a semicircle upon the cross arm as shown, and make a mark on the straightedge opposite the zero mark on the cross arm. Preferably, the graduations on the latter should be numbered up to 45 or 60° on each side of the central, or zero mark. This treatment of a T-square is advisable only for certain classes of work, as it will usually be found to diminish somewhat the accuracy of the square for ordinary use. For certain classes of drafting, however, the combined protractor and T-square will be sufficiently rigid, and will prove a very useful instrument.—L. B. Robbins, Harwich, Mass.



¶To prevent blowholes when pouring babbitt, drop a small piece of rosin into the ladle just before it is ready to pour.

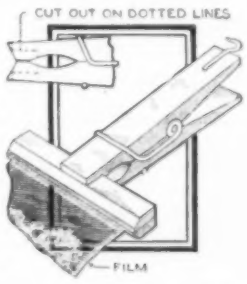
Bolting an Outside Cellar Door

Because convenient means of locking it are not usually provided, an outside cellar door sometimes offers a thief an easy entrance to a house. The illustration shows in diagrammatic form how a cellar door can be strongly latched by working a lever on the floor above. All the connections should be of good, strong steel wire, securely twisted at the ends. The wire, attached as shown to the pivoted disks, forms a light and strong substitute for a complicated linkage. The principal point to be taken care of in arranging the wires is that the lower disk must be placed as close as possible to the hinge line, so that, when the door is opened or closed, the wires will not be stretched.—P. G. Bernholz, East Orange, N. J.



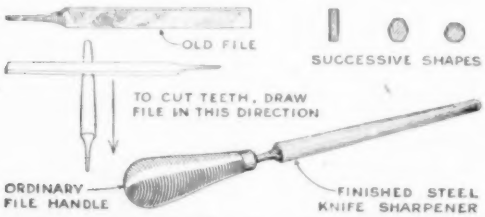
Clip for Drying Films

When a length of photographic film is hung up to dry after washing, it can be prevented from curling by attaching a specially made clip to the lower end, another similar clip being used to support it above. To make the clip, cut out a piece from the nose of a spring clothespin as shown in the sketch, making the cut about ⅛ in. deep. In the cavity formed in each of the two members of the clothespin, glue a piece of cigar-box wood, ½ in. wide and 3 in. long. Thrust a short piece of wire into a hole bored in the other end of the clothespin, and bend it into the form of a hook, so that the clip may be hung on a nail. The clip supports the film, while another one at the lower end keeps it from curling. If the weight of the lower clip is not sufficient for the purpose, a small piece of metal can be attached to the hook.—A. Gerish, New York, N. Y.



A Steel Knife Sharpener

A steel knife sharpener, such as the butchers use, may be easily made at home from an old file, all the tools required being an old iron plate to hammer on, a



An Old File Forms Excellent Raw Material for a Knife Steel, Which is Made by a Little Forge Work

hammer, a file, and a coal fire—one in the kitchen stove will do.

The file is heated to a bright cherry-red color, and hammered into the round shape illustrated. First, hammer on the edges, to upset the metal. It will be seen to work through the successive shapes shown in section. After it has been given a nearly round shape, and has a diameter of about ⅝ or ¾ in. at the large end and ⅜ in. at the small end, the process of rounding and finishing takes place. To do this, work with the steel at a dull cherry-red heat; starting at the large end, roll the steel on the plate, hammering around the entire circumference to remove the rough corners and make it as round and smooth as possible. Gradually work toward the small end, forming the taper while progressing. The steel will now probably be too long. The extra length is removed by nicking all around with a file, and breaking off the end. Hammer this end round, and the forging is complete.

Now heat the piece again to a cherry red, and allow to cool without quenching it, thus leaving it soft. When cold, the fine teeth must be put in. To do this, hold the steel tightly in a vise, or on the bench between nails. Use a sharp, coarse file, and hold it as shown in the picture, at right angles to the steel. Draw it from the small end to the large end, pressing firmly so as to cut the teeth as deep as possible. Proceed thus, drawing the file in only one direction, clear around the steel. Feel if the entire surface is well covered with these small scratches. If not, touch up any spot where they are lacking.

The steel must then be hardened, which is best accomplished, at home, in the following manner, as care has to be taken to keep the edges of the fine teeth from being burnt off: Mix a small handful of salt and a similar amount of wheat flour together, adding enough water to form a thick paste. The steel should be clean and dry; then coat it with the paste, so as to cover all the teeth well. Heat to a bright cherry red for the entire length, and plunge into water. When plunging the piece, hold it in a vertical position, which will prevent warping.

An ordinary file handle, fitted to the tang of the steel, finishes the job. A steel well made in this manner is equal to any that can be bought in the market.—S. B. Royal, Baltimore, Md.

A Homemade Postal Scale

This postal scale is easily made, and may give quite accurate results, as it does not depend on a spring, and there are no weights to be lost. The letter is placed on a wire rack, which hangs from a hook made of similar wire. The latter is fixed in the upper end of a swinging pendulum, to which a scale arm is attached, and which is weighted, if necessary, by boring deep holes in the lower part of the curved edge, and nearly filling them with shot, gluing in blocks to hold the shot and close the hole.

To make the graduations, first make a vertical mark on the standard just above the scale arm, and coinciding with the straight edge of the wide curved piece. This will then be the zero mark of the scale. Now, hang a 1-oz. weight by a fine thread from the letter rack, and

make a mark on the scale arm at the point just in front of the line made on the standard. Similarly, hang a 2-oz. weight from the rack, and make a mark for two ounces on the scale arm. This can be continued to the end of the scale arm, or until the weights shown run as high as will be needed. The spaces between the marks for the higher weights will be less than those between the lower figures, a peculiar advantage of this scale.

If no correct ounce weights are at hand, the marks can be found very nicely by using, instead of the 1-oz. weight, a new silver dollar, or, preferably, two new half-dollars and a one-cent piece, which will have a combined weight of one ounce, with an error of less than one per cent. The three coins are hung by a thread from the letter rack, and a line is made for the 1-oz. mark, which will be the most frequently used. For the 2-oz. mark, hang in a similar fashion two silver dollars, or four half-dollars and two one-cent pieces, if accuracy is desired. For other marks, similar combinations of coins can be used.

The dimensions of various parts of the scale may be gauged roughly from the photograph by comparison with the letter on the rack. None of these dimensions need be accurate or particular, since the marks on the scale are found entirely by experiment.—Charles A. King, Plymouth, New Hampshire.

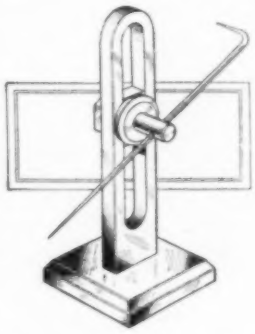
Easy-Operating Can Opener

An officer in France introduced a can opener on the American front which did its share in simplifying the work of handling commissariat stores. He had observed the muscular effort that was necessary when a woman canteen worker was compelled to use a dull opener, which was often the only one to be found. It required all her strength to make the blade cut the tin, and the number of cans to be opened was almost beyond calculation. The remedy was the opener with the heavy wooden frame shown in the photograph. Metal clamps hold the can, while the blade is forced into its top by pressure on the handle of the upper member of the frame. The blade is fixed to a metal arm which is pivoted to the frame at a point corresponding to the center of the can, and is turned by a crank on the top of the frame. One revolution cuts out the entire top of the can, which is then lifted out without leaving dangerous jagged edges. This can opener reduces exertion to a minimum.

PHOTO, COURTESY AMERICAN RED CROSS

An Inexpensive Surface Gauge

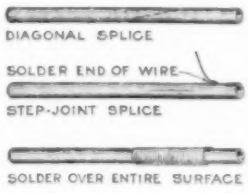
The little surface gauge shown in the diagram should prove attractive to the metal worker who is unable to make a large expenditure for tools. With the aid of this instrument, and a piece of plate glass as a surface plate, quite accurate layouts can be made.



The base of the instrument is merely a block of steel or cast iron. The standard is held to this by means of two small machine screws, which pass through the base from the bottom. To make the long slot in the standard, a series of holes are first drilled in it. After this is done, the superfluous metal is filed out. The scriber is held in a small stud with a threaded end which protrudes through the slot. A knurled nut is put on the stud first, and a square nut or washer, with a protruding section which slides in the slot to prevent it from turning, is fitted and soldered to the far end of the stud, after inserting it in the slotted standard.

Splicing Thin Tubing

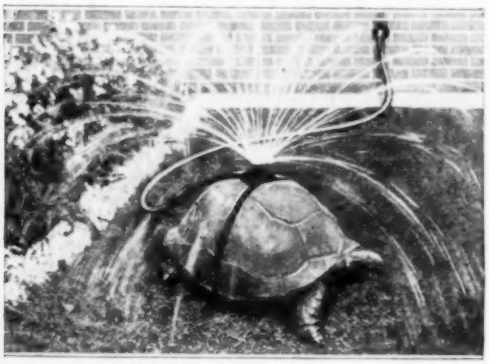
The splicing of copper or brass tubing is not difficult when a piece of tube is at hand of the correct diameter to slip over the outside. Without such a tube, however, the job can be done with a piece of copper wire in the manner illustrated.



Cut the pipe ends diagonally, or else make a step joint. Tin the faces that butt together. Attach one end of the wire to the pipe with a drop of solder, and wind the wire around the junction so as to cover it completely. Then wet the joint and the wire all over with soldering acid; hold the joint in a flame until it is hot enough to melt the solder; apply sufficient solder to hold the wire tightly, and form it into a solid covering. The junction made in this way may be stronger than the tube itself, because of the extra thickness of metal.

TURTLE CARRIES SPRINKLER ON FIRE-STATION LAWN

Man has found useful work for the slow-moving turtle. On the lawn of a fire-department station in a California town, a giant of the species is efficiently serving as an animated sprinkler, simply by roaming



Slowness Makes This Enormous Turtle Efficient at Its Task, That of Carrying a Sprinkler over a Fire-Station Lawn

over the grass with a spraying nozzle strapped to its back. The hose which connects the nozzle to a hydrant acts as a leash to keep the shell-covered creature from wandering away from its task. Practically all of the lawn is watered during the course of a day.

PRIZES OFFERED FOR ESSAYS ON ARTILLERY SUBJECTS

Two cash prizes, the first $150 and the second $100, are offered for essays on coast-artillery or heavy-artillery subjects, by the Journal of U. S. Artillery. No limiting length is specified, but the copy must be typewritten, double-spaced, and sent in triplicate. If illustrated, original photographs, drawings, or tracings must constitute one of the three copies. The manuscript is to be signed with a nom de plume only, and be accompanied by a sealed envelope identifying the nom de plume with the author's name. Essays, to be eligible in the competition, must be in the hands of the editors on or before Dec. 31, 1919, in an envelope marked "Essay Competition." The committee of award will be appointed by the Coast Artillery Training Center Staff, and all essays become the property of the journal.

CLUB OFFERS LARGE PRIZE FOR DESCRIPTIVE NAME

For the name which will best describe all of the English-speaking countries of the world, a prize of $1,000 has been offered by the World Trade Club of San Francisco, an organization which is carrying on a campaign for the adoption of the metric system of weights and measurements in the United States and the British Empire. Some of the names already suggested include "Sam-Bull," "Ambria," and "Ambritica." The money will be paid May 15, 1920.

¶Sunrise and sunset hours change so little in the Canal Zone that the daylight-saving law never went into effect there. In the summer the sun rises at about 6:00, and sets at 6:40; in the winter it rises at 6:35 and sets at 5:50.

BRIDGE RULES IN RIME

By CHARLES H. WRIGHT

"Jingle rules" are usually the easiest remembered and therefore the most useful. The author, having recently mastered the game of bridge, wrote the following verses for his own use. Others tried them and praised the idea; therefore we print them for the assistance of our readers.—Editor.

In bidding, do remember this:
Don't fib, whate'er you do.
Your partner cannot see your cards,
So tell him what is true.

The Original Bid

With one trick sure, five in that suit,
Should bidding with you start,
And in a side suit one more trick,
You bid a spade or heart.

Don't bid one diamond or one club,
'Less two such tricks in sight;
And other guarded strength you need,
For no-trumps you invite.

Bid no-trump without doubt or fear
With three suits guarded well;
But be alert for trouble sure
Which other bids foretell.

The Second Bid

With three strong suits, should dealer bid
Your weak one, then you "double."
To double no-trumps, have a care;
You may be courting trouble.

The Third Bid

Don't help your partner in his bid
Unless your suit is strong.
His club or diamond one take off;
To fail in this is wrong.

The Fourth Bid

If partner doubles one in suit—
No-trump is quite the same—
To leave him in courts instant death.
You'd better quit the game.

Unless one's sure to make the game,
Fourth hand won't make first bid.
Best let your partner deal new cards
And of these hands be rid.

The Lead

The choice of suit depends somewhat
On bidding gone before;
But independent leads should be
From suits not less than four.

A king lead says, "I've queen or ace."
Ace, king, led says, "No more."
The queen or jack tops sequence sure
Of two or three or four.

The nine lead is of nothing top.
Deuce says, "This suit is weak."
In fact, a three or four spot led
Claims little, so to speak.

The leads of fourth best of a suit
In many ways apply.
They show your partner without fail
Where winning cards may lie.

Now, when you play, don't e'er forget,
Watch all the cards that fall.
They have a meaning every one;
They have a meaning all.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]